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Journal of Educational Research

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VOL. VII — MAY, 1923 — No. 5

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Entered as second-class matter at the Post Office at Bloomington, Illinois, under the act of March 3, 1879.

Journal of Educational Research

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Public School Publishing Co.

Official Organ of the Educational Research Association

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The JOURNAL OF EDUCATIONAL RESEARCH is published at Bloomington, Illinois, monthly, except July and August by the Public School Publishing Co. The subscription price is $4.00 ($4.20 in Canada or Mexico; and $4.30 in other foreign countries.

The editorial office is at Columbus, Ohio. Address all communications on editorial matters to B. R. Buckingham, Director of Bureau of Educational Research, The Ohio State University, Columbus, Ohio.

Subscriptions and all communications about reprints or other business matters should be addressed to the Public School Publishing Company at Bloomington, Illinois.

JOURNAL *of* EDUCATIONAL RESEARCH

Volume VII MAY, 1923 Number 5

THE TWO-YEAR CURRICULUM FOR TRAINING ELEMENTARY TEACHERS

SHELTON PHELPS
George Peabody College for Teachers

When a dean or a president in a normal school is confronted with the problem of determining what courses to put into his two-year curriculum for training elementary teachers, the probabilities are that he will secure as many current catalogues as he can—or perhaps a favorite one—and then by a process of selection build his curriculum. While in this procedure he is usually handicapped by not having sufficient time at his disposal, and a sufficiently large number of catalogues to give him a representative sample; he is nevertheless using in a partly haphazard way the methods of the student of practice. The dean or president when analyzing practice as it appears in the catalogues is apt to interpret largely on the basis of his individual judgment, while the student who is making a quantitative study of practice will choose his standards more carefully, and depend less on personal judgment or personal opinion. There is, accordingly, a smaller percent of error in the latter procedure. It remains true, however, that the procedure in the two cases is in general the same. The latter plan simply does systematically and by the best developed technique what the former plan aimed at.

The following article sets forth the results of a quantitative study made by a group of students,[1] on the problem "What

[1] This study was made as one of the class studies in a course in normal-school administration given in George Peabody College for Teachers. The group which made the study was composed of: Mr. Southerland, director of extension, State Normal, Livingston, Alabama; Mr. Mallory, professor of mathematics, Union University, Jackson, Tennessee; Mr. ReBarker, instructor in the Peabody Demonstration School; and Mr. Windes, now with the United States Bureau of Education.

courses should make up the two-year curriculum for training elementary teachers in normal schools and how much time should be allotted to each?" To be sure that the sampling of current catalogues was a representative one 94 catalogues from 40 different states were studied. The results obtained were interpreted by comparison with the best standards which could be obtained. Where personal judgment was a factor a consensus of judgments was secured. From the results of the study a suggested curriculum was formed. The purpose of publishing the study is to make the results available for those interested in working out a curriculum or in revising an existing one.

The Problem

The catalogues of 47 four-year normal schools and 47 two-year normal schools in 40 different states were studied. The purpose of the study was to discover, so far as possible, what courses should constitute the two-year curriculum for training elementary teachers. Practice was considered one of the determining factors on the assumption that it represented the consensus of judgment of those foremost in normal-school administration. In order to determine what that practice really was, the facts found were treated statistically in so far as this seemed helpful in getting at their meaning. Since there were two very different groups of normal schools involved—those giving four years of college work, and those giving two years of college work—each group was treated separately. The one fundamental question in the study was, *What subjects should be included in a two-year curriculum for training elementary teachers and what relative importance should each have?* To answer this question, it was necessary to answer a number of subordinate questions which appear in the following discussion. The two-year curricula in four-year normal schools were treated first. The questions treated in order were:

1. How many college hours were required in this two-year curriculum?
2. How many hours were required in subjects in education?
3. How many hours were required in other subjects?

4. What courses were required in education, and what was the relative importance of each course as shown by: (1) the number of normal schools requiring it of all students finishing the two-year curriculum, and (2) the median number of hours required by them in each subject?
5. What other courses were required besides education, and what was the relative importance of each as shown by: (1) the number of schools requiring each, and (2) the median number of hours required in each?
6. How can a curriculum be constructed for the training of elementary teachers in a normal school?
7. How many college hours were required to complete the two-year curriculum for training elementary teachers?

The Number of Hours Required in a Two-Year Curriculum

Table I indicates the wide variability in the number of hours required to complete a two-year curriculum in the different

TABLE I. DISTRIBUTION OF SCHOOLS ACCORDING TO THE TOTAL NUMBER OF HOURS REQUIRED FOR GRADUATION

Number of Quarter Hours Required*	Four-Year Schools	Two-Year Schools
More than 140	0	11
136—140	1	0
131—135	0	4
126—130	0	4
121—125	2	1
116—120	3	7
111—115	2	6
106—110	1	1
101—105	1	3
96—100	22	7
91— 95	0	1
86— 90	14	1
81— 85	0	0
75— 80	1	1
Total number of schools.....	47	47
Median number of hours required.....	98	118
Group which is required by greatest number of schools..	96—100	116—120

*All hours, regardless of how catalogued have been reduced to a sixty-minute basis.

schools. Why should the curriculum for accomplishing the same purpose in the same type of schools contain 75 quarter hours in one school and 140 in another? Why should there be twenty hours difference between the typical school in one group, and the typical school in the other group? Why should the two-year curriculum for training elementary teachers in the four-year schools differ materially from the length of the two-year curriculum required to train the same type of teachers in the other type of normal schools? Which of the two types of schools represents the better practice?

It seems without question that the traditional practice is represented by the group of two-year schools. They constitute the original normal school. From them the four-year schools were evolved. But the school with 96 to 100 hours required to complete a two-year curriculum represents the strongest tendency and probably the best administrative practice among normal schools. Further, from 180 to 200 quarter hours represents the best standard of practice for a bachelor's degree—the four-year schools in their two-year curriculum are approximating in extent the first two years of college work. They are also approximating the amount of work done by the standardized junior colleges. Finally 98 to 100 hours represents about 16 hours of work per week, per quarter, per semester, or per session. The best practice fixes the student's load in undergraduate work at from 15 to 18 hours of work. To complete the curriculum in the two-year schools in the normal period of time, six quarters, requires a student load of 19 to 20 hours. This cannot be justified, in the light of the best practice.

In working out a two-year curriculum for training elementary teachers, or in revising an existing one, whether it be in a two-year or a four-year school, it seems best to require for its completion 96 to 100 hours of work. It must be remembered that the strongest tendency in normal-school administration is the changing of two-year normal schools to four-year normal schools or teachers' colleges. Not less than twenty states are included in this movement at the present time. Perhaps one of the strongest

motives for this change is to make the normal schools of standard college grade, and to free them from what they believe, at least, to be unfair discriminations in the transfer of credits to other institutions. No matter where a two-year curriculum is formed now, it is likely in the next few years to be supplemented by a four-year curriculum. It will fit most easily into a standard college program if it conforms to the best college practice in regard to the student load, maximum hours of credit, etc. *The four-year schools seem to have started a good piece of standardization in this regard.*

The Number of Hours Required in Education

The summary of Table II raises the question, Which is the sounder practice in a two-year curriculum for elementary teachers, 30 hours of required education or 43 hours? Have the four-year schools in order to get "college credit" subjects put too little emphasis on "teaching to teach"? For the outstanding point in Table II is that on the average the four-year

TABLE II. NUMBER OF HOURS IN EDUCATION REQUIRED OF THOSE WHO COMPLETE THE TWO-YEAR CURRICULUM

Number in Hours in Education Required	Four-Year Schools	Two-Year Schools
71—75	0	3
66—70	1	1
61—65	4	3
56—60	1	4
51—55	0	7
46—50	3	4
41—45	1	3
36—40	4	7
31—35	5	7
26—30	7	4
21—25	10	1
16—20	4	3
11—15	2	0
6—10	2	0
1—5	0	0
0—	3	0
Total number of schools.....	47	47
Median number of hours required.....	28.9	42.5

schools are requiring of their graduates an appreciably smaller proportion of education courses than are the two-year schools.

To decide which practice is more nearly sound involves some standards for comparison. Practice in other countries, and the opinions of experts are the only ones available. In regard to the amount of education required, the four-year schools are much nearer European practice than are the two-year schools. Doctor Shreve[2] in a study of the relative amounts of professional and academic work required in foreign systems reports the conditions shown in Table III. Practice in American schools is added for comparison.

TABLE III. THE AMOUNTS OF EDUCATION REQUIRED BY NORMAL GRADUATES IN OTHER COUNTRIES

Normal Schools in Different Countries	Relative Amounts of Education Required Expressed in Tenths of Total Program
French	0.1
English	0.2
Prussian	0.2
American	
Four-year	0.3
Two-year	0.4

It is readily seen that on the basis of this standard, the four-year schools are nearer the practice of European schools. It is apparent that European practice alone cannot be made the basis for deciding what should be the practice in an American normal school. It is, however, one of the standards from which an answer is sought. A second is expert opinion expressed in the study of the teacher-training institutions in Missouri.[3] In this, a number of suggested curricula were presented. This was doubtless, at the date of its publication, the most systematic study of normal-school curricula which had been made. In its two-year curriculum for training elementary teachers it required

[2] Shreve, Francis, *The administration of normal schools.* An unpublished study in education.

[3] Learned, W. S., and others. *The professional preparation of teachers for American public schools.* (Bulletin No. 14) New York: Carnegie Foundation for the Advancement of Teaching, 1920. 475 pp.

three-tenths of the time in education subjects. In other words, it is rather closely in accord with practice in the four-year schools. In the light of these two standards, which seem the best available, *the four-year schools are more nearly sound in the amount of education required, than are the two-year schools.*

The Number of Hours Required in Other Subjects

In other subjects required Table IV shows that there is more extended election in the curriculum of the four-year than of the two-year schools. This is not in harmony with either of the two standards used before. In European normal schools this curriculum is practically a prescription of courses. The suggested

TABLE IV. NUMBER OF HOURS IN "OTHER SUBJECTS" REQUIRED OF THOSE WHO COMPLETE THE TWO-YEAR CURRICULUM FOR TRAINING ELEMENTARY TEACHERS

Number of Hours in "Other Subjects"	Four-Year Schools	Two-Year Schools
131—135	0	1
126—130	0	2
121—125	0	0
116—120	0	0
111—115	0	0
106—110	0	0
101—105	0	1
96—100	0	2
91— 95	0	1
86— 90	0	7
81— 85	0	1
76— 80	0	2
71— 75	1	2
66— 70	0	2
61— 65	1	0
56— 60	4	0
51— 55	6	5
46— 50	2	5
41— 45	3	1
36— 40	2	2
31— 35	3	4
26— 30	3	0
21— 25	1	3
16— 20	9	3
11— 15	0	1
6— 10	4	1
1— 5	1	0
0— 0	0	0
Median	34	54

two-year curriculum by the Carnegie Survey Staff, already referred to, is almost wholly a prescribed one. Technical schools allow election among curricula, not within a curriculum to any great degree. If training elementary teachers is a technical thing, and if teacher-training institutions sincerely believe that it is, why should not the courses which make up the curriculum for giving this technical training be chosen on the basis of the best available consensus of expert judgments rather than be left to the judgment of the single individual, the student who is electing the courses. Is it not entirely possible that the rather common practice of election in general college courses is responsible for this attitude on the part of the four-year normal schools?

These show much less variability as measured by half the range of the middle 50 percent both in regard to the requirement in education and in other subjects. This would mean that their practice is more likely a definitely worked out affair, and less haphazard in its nature. It seems to have been partly the result of an effort at standardization.

In four-year schools a little over one-third (35 percent) of the total work is required in prescribed subjects other than education. In the two-year schools nearly half (47 percent) of the total work is in such subjects. In this regard the two-year schools when measured by the standards already referred to seem more nearly sound. One-sixth of the work within a technical curriculum seems enough to be left as free elective. How can there be any certainty of the student securing specified technical training otherwise? Is it not entirely possible that the practice of the colleges of arts and sciences has again been a determining factor? In organizing such a curriculum it seems sound to require at least half of the work in prescribed subjects other than education.

Table V shows for the four-year and the two-year schools the educational subjects which are most generally offered. Concerning each of these subjects the number of institutions offering it, the rank subject, and the median number of hours re-

TABLE V. EDUCATIONAL COURSES IN FOUR-YEAR AND TWO-YEAR COURSES AND AS RECOMMENDED IN THE CARNEGIE SUGGESTED CURRICULUM

Name of Course	Four-year Schools			Two-year Schools			Carnegie Suggested Curriculum	
	Number required	Ranking of subject	Median hours required	Number required	Ranking of subject	Median hours required	Subjects recommended	Hours recommended
General Method	40	1	10.3	20	5.5	5.0		
Educational Psychology	30	2	4.7	18	8.0	5.0		
General Psychology	29	3	4.5	39	2.0	6.2	x	6
Principles Teaching	27	4	4.6	19	7.0	5.3	x	3
Practice Teaching	26	5	8.3	42	1.0	10.8	x	9
History of Education	21	6	5.1	26	3.0	5.3		
Observation	19	7	5.4	20	5.5	6.0		
Classroom Management	16	8	3.8	21	4.0	4.0	x	4
Teaching Courses	14	9	4.5	6	12.0	7.5		
Child Study	12	10	4.5	12	10.0	4.3		
Special Method	8	11	8.0	18	8.5	20.8		
Elementary Curriculum	5	12	4.2	0	....	0.0		
Public School Administration	2	13	3.5	0	....	4.3		
Tests and Measures	2	14	4.0	8	11.0	5.3	x	1
Ethics	0	15	0.0	3	13.5	3.0		
Pedagogy	0	16	0.0	3	13.5	5.8		
Educational Sociology	0	17	0.0	2	15.0	4.5		

quired by the institutions are shown. Of the subjects listed in Table V those recommended by the Carnegie suggested curriculum are indicated by x. With respect to these subjects the recommended number of hours is also given. Both groups of schools agree concerning the subjects having the first eight ranks. Different positions are given the individual subjects but the same subjects are given the first eight positions. This seems to indicate that both groups of schools are agreed that these subjects are the ones most important for elementary teachers.

Table VI shows the rank order of subjects other than education as that order is determined by the number of schools requiring these subjects. This is shown for both the two-year and the four-year schools. A final column shows the subjects recommended in the Carnegie suggested curriculum. There are

fifteen courses which are ranked in the first-half of the courses by each group, as determined by the number of schools requiring them. Of these, ten are also checked as having been recommended by the Carnegie suggested curriculum.

A Curriculum Suggested for Two-Year Normal Schools

If the ten courses on which the four-year schools, the two-year schools, and the Carnegie suggested curriculum are agreed, be taken as the required "other" courses in the curriculum, and the four education subjects on which all are agreed, plus the one course (Tests and Measures) which the earlier studies of Guinn[4] and Ruediger[5] find as a "tendency" to be added, the ratio between education courses and other subjects will be about that agreed on earlier in the discussion.

It should be remembered that only the subjects of the Carnegie curriculum with which practice in both types of schools concur, were checked x. There were others suggested, but these were not considered since practice in both types of schools had not included them. There seemed no reason to believe that they had not been considered, and left out by the administration for there seemed nothing new about the suggestions.

Taking into consideration the median number of hours required in each subject by the practice of the two types of schools and the recommendations of the suggested Carnegie curriculum (see Tables V and VI), the schedule given in Table VII was arranged. This would give a curriculum with from 68 to 82 hours of required work, and would probably leave as much for election as is desirable in working out a curriculum for a technical school. It is more nearly in agreement with practice than it is with expert opinion. The Carnegie curriculum leaves less to be elected. There is probably room for another prescription, that of physical education and music. Both practice and theory are agreed that these subjects should be required. They are divided,

[4] Guinn, J. M., "Tendencies in the content in courses in state normal schools," *Educational Review*, 39:156, February, 1910.

[5] Ruediger, W. C., "Recent tendencies in the normal schools of the U. S.," *Educational Review*, 33:271, March, 1907.

TABLE VI. SUBJECTS OTHER THAN EDUCATION IN FOUR-YEAR AND TWO-YEAR COURSES AND AS RECOMMENDED IN THE CARNEGIE SUGGESTED CURRICULUM

Name of Course	Four-Year Schools			Two-Year Schools			Recommended in Suggested Carnegie Curriculum	
	Number requiring it	Rank of subjects	Median hours required	Number requiring it	Rank of subjects	Median hours required	Subjects	Hours
Music	25	1.0	4.8	35	1.0	6.3		
English	22	2.0	8.5	24	4.5	8.5	x	5
Drawing	20	3.5	5.6	24	4.5	5.6		
Composition	20	3.5	4.6	15	11.0	4.8		
Physical Education	18	6.0	6.3	28	20.0	8.6		
American History	18	6.0	5.0	17	8.5	5.7	x	10
Ancient History	18	6.0	5.0	0	0.0	0.0		
Industrial Arts	11	8.5	7.3	21	7.0	6.3	x	3
Sociology	11	8.5	4.7	16	10.0	5.2	x	5
Geography	10	10.0	4.7	25	3.0	5.8	x	5
Arithmetic	9	12.5	4.8	22	6.0	5.2		
Reading	9	12.5	4.4	9	20.5	3.8	x	3
Writing	9	12.5	2.8	17	8.5	2.5		
Hygiene	9	12.5	4.3	8	24.0	5.3	x	3
Biology	8	15.0	5.5	9	20.5	5.6	x	4
English Literature	5	16.5	8.6	13	15.0	5.6	x	5
Science	5	16.5	4.5	8	24.0	6.0	x	4
Agriculture	4	19.0	4.4	11	18.0	5.1		
Home Economics	4	19.0	5.0	13	15.0	6.3		
Grammar	4	19.0	4.0	13	15.0	4.8		
Expression	3	22.5	3.0	9	20.5	3.3		
Nature Study	3	22.5	3.5	14	12.5	6.5		
Civics	3	22.5	3.3	14	12.5	5.4		
History	3	22.5	3.7	12	17.0	5.2		
Reviews	2	25.5	5.5	1	36.0	12.0		
Physiology	2	25.5	7.0	9	20.5	5.3		
Economics	1	29.0	3.0	5	31.0	5.8		
Algebra	1	29.0	4.0	5	31.0	8.4		
American Literature	1	29.0	5.0	5	31.0	4.0		
Modern Language	1	29.0	5.0	3	35.0	10.8		
English History	1	29.0	7.5	4	34.0	5.6		
Ancient Language	0	....	0.0	2	35.5	10.8		
Spelling	0	....	0.0	7	27.0	3.3		
Physics	0	....	0.0	5	31.0	10.3		
Playgrounds	0	....	0.0	1	36.0	2.0		
Art	0	....	0.0	8	24.0	6.0		
Chemistry	0	....	0.0	6	28.0	8.0		
Mathematics	0	....	0.0	5	31.0	4.3		
Geology	0	....	0.0	2	35.5	5.5		

however, on the matter of whether or not credit should be given for them. Theory says they should be required but no credit given them; practice says they should be required and credit should be given. From an administrative standpoint practice would seem to have the more nearly sound position. It is hard to understand how the subjects could be brought to a place in the curriculum commensurate with other subjects unless they are put on a *credit* basis. Again these are not new subjects and no doubt normal-school administrators have repeatedly discussed this problem. Their verdict has evidently been *for credit*. Physical education and music should be put on a credit basis and added to the subjects already named. They would doubtless complete the list of prescribed subjects.

TABLE VII. A DESIRABLE TIME ALLOTMENT FOR COURSES IN A TWO-YEAR CURRICULUM ARRANGED FROM THE MATERIAL SUMMARIZED IN TABLES V AND VI

Name of Course	Number of Quarter Hours Required					
	3 to 4 hours	5 to 6 hours	7 to 8 hours	8 to 9 hours	9 to 10 hours	Whole-Curriculum
Practice Teaching					x	
Psychology		x				
Classroom Management	x					
Tests and Measures	x					
Principles of Teaching	x					
English			x			
Literature		x				
American History					x	
Sociology		x				
Geography	x					
Science		x				
Industrial Arts		x				
Biology	x					
Hygiene	x					
Total Number of Hours	18 to 24	25 to 30	7 to 8		18 to 20	68 to 82

Summary

This study answers the questions set forth in the beginning in the following ways:

1. The number of college hours which should be required to complete a two-year curriculum for the training of ele-

mentary teachers should be between 90 and 100 quarter hours. This not only conforms to the best expert opinion, but embodies as well the practice in standard colleges other than teachers colleges. This number will also provide the standard number of hours of student load for those completing the curriculum in the normal length of time, six quarters.

2. About three-tenths of these 90 to 100 hours, namely from 27 to 30 hours, should be in education. This will conform to the most conservative American practice and to leading opinions, on normal-school administration when present practice is compared with practice shown in the earlier studies of Guinn and Ruediger. It also approaches more nearly the practices of other countries, which have made progress in teacher-training.

3. In other subjects there should be a total number of 48 to 60 quarter hours in required subjects. This follows the practice in technical schools, of prescribing most of the work within a curriculum, and provides for election among the several curricula. It also approximates more nearly practice in other countries and is in agreement with expert opinion.

4. The required courses in education, which practice in both groups of normal schools and expert opinion agree should be placed among the required subjects are: practice teaching, principles of teaching, psychology, and classroom management. Add to these four, tests and measurements, a new subject or a "tendency" in practice which is also recommended by expert opinion, and the five could constitute the required courses in education. Practice teaching should require 9 to 10 quarter hours; principles of teaching, 3 to 4 hours; psychology, 5 to 6 hours; classroom management, 3 to 4 hours; and tests and measurements, 3 to 4 hours.

5. In subjects other than education the study indicates that the following subjects with their indicated time allotment should

complete the curriculum. These are subjects which practice in both groups of schools and expert opinion are agreed should be first among those required. They are: English, 7 to 8 hours; American history, 9 to 10 hours; sociology, 5 to 6 hours; biology, 3 to 4 hours; literature, 5 to 6 hours; science, 5 to 6 hours; industrial arts, 5 to 6 hours; hygiene, 3 to 4 hours; reading and geography, 3 to 4 hours. These subjects would constitute the academic part of the curriculum.

6. In answer to the final question of the study how can a curriculum be made from these facts, the answer would be to take 96 hours of work which would contain the courses with the time apportionment indicated in Tables V and VI. If divided evenly between the two years there would be 48 hours of work per year, which would be 16 hours per quarter or 16 recitation hours per week. This would agree with the standard student load. There is a lack of agreement as to how the courses should come but the following arrangement is suggested. This suggestion does not come from prerequisites found in practice. The study reveals little or nothing on this point. The time when a student will be allowed to take certain courses is not definitely prescribed. The suggestion as to arrangement comes largely from expert opinion, and from practices in schools of education in state universities.

SUGGESTED ORDER OF COURSES

First Year

Courses	Hours
English: Composition, rhetoric, and grammar	6
Literature	6
American History and Government	9
Science	6
Industrial Arts or Home Economics	6
Psychology	6
Hygiene	3
Electives	6
Total	48

Second Year

English	2
Sociology	4
Biology	4
Reading	3
Geography	3
Classroom Management	4
Principles of Teaching	4
Tests and Measures	4
Practice Teaching	10
Electives	10
Total	48

One decided advantage to this arrangement of courses is that it would give the first year of college work almost entirely to furthering the academic basis which should be required before taking up the technical work in education. It is assumed throughout this study that all entrance to this curriculum will be only upon the completion of 15 standard units of high-school work. (Only those schools, which specifically stated this requirement were included in the study of practice.) *There will be then one year of academic college work required of those who finish this two-year curriculum.* This curriculum does not provide a dropping-out place at the end of the first year. But it must be kept in mind that this is a *two-year curriculum for training elementary teachers, not a one-year curriculum.*

This arrangement of courses it seems would offer the best basis for passing on into the work of the four-year curriculum. For it must also be kept in mind that not for a great while longer will two years of college work suffice as training for elementary teachers. Many of those who have completed the two-year curriculum will pass on into the four-year. It is desirable that they do so with the least possible waste. Since more than half that four-year curriculum will be academic, this arrangement seems to be rather well adapted to "building-on purposes."

It yet remains to say what the content of the courses which make up this curriculum shall be. That, however, is a problem for further investigation.

SCIENCE OF EDUCATION[1]

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Doctor John Dewey came to China from Teachers College, Columbia University, to represent American philosophy of education. Doctor Paul Monroe came the following year from the same institution to represent American organization of education. This year the National Association for the Advancement of Education has invited me from the same institution to follow in the footsteps of my more illustrious predecessors and to represent American science of education, while my colleague, Professor Twiss of Ohio State University, represents scientific education.

I expect to be stationed at Nanking during the first semester and at Peking during the second semester. Since I shall be with the Association only one year, it is evident that I shall have to work through others. Indeed I should prefer to do so anyway. Already some sixty individuals have accepted the invitation to assist the Association to complete its program for the year and to adjust to this program studies already under way.

Scientific studies of education may be classified roughly under four heads, namely, mental and physical measurements, statistical methods, experimental investigations, and causal investigations. Long before I planned to come to China, I learned that numerous able students of Chinese education had launched a vigorous series of both pure and applied researches in all these fields. Just at present, however, the most active movement, and the one engaging the attention of most workers, is that for mental measurement. Partly because mental measurement provides the best immediate center for the organization of cooperative research, and partly because of its greater practical promise

[1] This article is slightly condensed from a paper prepared by Doctor McCall for distribution both in Chinese and in English to his collaborators in China.

for improving the efficiency of instruction, the first part of the Association's program calls for the construction of a series of educational and intelligence tests for the elementary and secondary schools. Some attention will also be given to tests for the primary schools and colleges.

The Association's program for mental measurement, the details of which will be presented later, was formulated during a week's conference at Nanking, and another like conference at Peking. At these conferences a series of principles were formulated to control the construction of all tests. In my judgment the most important of these, omitting from consideration certain absolutely essential technical criteria, were the two that follow.

1. Since the experience of America shows the tremendous influence for good or ill which standard tests exert upon education, the first consideration in the preparation of any test should be given to its probable future influence upon educational practice. For example, it was in order to satisfy this principle that long and complicated examples in arithmetic were omitted from the arithmetic test given below. The presence of such examples would inevitably induce the teacher to train pupils beyond the maximum essential set by modern educational practice.

2. All tests should be scaled, so as to permit the use of data for scientific as well as practical purposes. All scaling should be according to some uniform system, so as to secure comparability of scores from test to test and thus facilitate the tabulation and interpretation of results. Direction booklets should be modeled after a standard design, so that teachers will find it necessary to learn but one procedure.

The selection of the uniform system of scale construction required more time than any other item on the agenda. After a detailed study and discussion of the merits and demerits of existing systems of scale construction, and after listing some 25 criteria for evaluating scale systems, the conferees graded these criteria for significance and then graded each scale system according to the completeness with which it satisfied each

criterion. Thus the final selection was made according to the method of consensus of judgment. The result unanimously favored the TBCF system, described below.

This scale system is a sort of eclectic one, representing as it does an attempt to embody as many as possible of the best features of the other leading systems, namely, grade-scale, percentile-scale, and age-scale. Had it not been for the presence of foreigners and the vigorous debates of the native Chinese educated abroad to other systems, I should fear that the final selection was an evidence of proverbial Chinese courtesy rather than of the superior worth of the system selected.

In order to give a concrete illustration of how this scale system will operate in practice there follows an unfinished sample of Form 1 of an arithmetic test now in process of construction. Since many weeks must elapse before this test is scaled, I must ask the reader both to forgive a discrepancy and to use his imagination. All the tables for use in scoring refer to another test of 35 elements instead of for this arithmetic test of 80 elements. Otherwise the tables may be thought of as applying to the arithmetic test.

The first page of the test contains preliminary directions to the pupils, blanks for filling in data as to name, age, school, grade, and date, and space for entering the scores.

CHINESE FUNDAMENTALS OF ARITHMETIC SCALE

FORM 1

Add	(1) 3 4 —	(2) 6 2 —	(3) 7 5 —	(4) 7 9 —
Subtract	(5) 6 3 —	(6) 8 4 —	(7) 9 5 —	(8) 8 0 —
Add	(9) 3 1 7 —	(10) 8 0 5 —	(11) 24 4 —	(12) 50 6 —

Subtract	(*13*) 29 − 6	(*14*) 74 − 4	(*15*) 76 − 32	(*16*) 92 − 21
Multiply	(*17*) 4 × 2	(*18*) 3 × 3	(*19*) 7 × 3	(*20*) 8 × 6
Divide	(*21*) $2\overline{)6}$	(*22*) $4\overline{)8}$	(*23*) $4\overline{)36}$	(*24*) $7\overline{)49}$
Add	(*25*) 32 + 25	(*26*) 72 + 26	(*27*) 69 + 4	(*28*) 58 + 8
Subtract	(*29*) 34 − 8	(*30*) 44 − 7	(*31*) 41 − 26	(*32*) 86 − 19
Multiply	(*33*) 24 × 2	(*34*) 20 × 4	(*35*) 28 × 7	(*36*) 63 × 9
Divide	(*37*) $2\overline{)178}$	(*38*) $4\overline{)260}$	(*39*) $5\overline{)845}$	(*40*) $7\overline{)973}$
Add	(*41*) 75 + 37	(*42*) 43 + 89	(*43*) 984 + 253 + 457	(*44*) 328 + 571 + 185
Multiply	(*49*) 407 × 7	(*50*) 350 × 8	(*51*) 65 × 36	(*52*) 76 × 57
Divide	(*53*) $9\overline{)54054}$	(*54*) $8\overline{)16200}$	(*55*) $43\overline{)559}$	(*56*) $27\overline{)864}$
Add	(*57*) 72 + 46 + 53 + 98 + 28 + 70 + 69 + 98	(*58*) 28 + 95 + 60 + 72 + 89 + 43 + 39 + 39	(*59*) 48.19 + 96.13	(*60*) 6.43 + .78 + 79.
Subtract	(*61*) 5004 − 169	(*62*) 3500 − 2891	(*63*) 7.32 − 2.59	(*64*) 75. − 8.63
Multiply	(*65*) 60 × 70	(*66*) 51 × 6.00	(*67*) .59 × 8	(*68*) .90 × 7

Divide	(69) 68)68544	(70) 97)1949700	(71) 66)193	(72) 83)431.6
Multiply	(73) 58 × .37	(74) 76 × .09	(75) 75.5 × 5.98	(76) 72.3 × 8.06
Divide	(77) .40)2.42	(78) .90)3.59	(79) .03)8.76	(80) .08).46

Accompanying the test are: (1) general directions for applying it; (2) instructions to be read with the pupils; and (3) detailed directions to the teacher for scoring and computing the derived measures. The last will be given in full. The full time given to the pupils for working on the test is thirty minutes, although they are stopped at the end of ten minutes and are required to circle the example they are then working. Answers are required to be in decimals rather than fractions, since China is practically on a decimal basis.

How to Score the Test

Take a blank test paper and fill it out with the correct answers given below.[2] This scoring stencil may be creased in successive folds, thus making it possible to lay the row of correct answers just below the pupil's answers. Draw a line through every incorrect or omitted answer and write the number of correct answers in each row to the right of that row. Compute the total number of correct answers made on the entire test by each pupil and write this in the "Examples correct" space provided on the front page of his paper.

To be counted correct a pupil's answers must agree exactly with those given below. Each example is scored as either wholly right or wholly wrong. No partial credits are given. When an answer has been corrected by the pupil, the correction is the answer to score. The use of fractions instead of decimals is scored as incorrect in order to discourage a cumbersome practice. If pupils must meet fractions in their environment, they should be taught how to convert fractions into decimals. Omis-

[2] These answers are not here reproduced.

sion or misplacement of a decimal point makes the answer wrong. The presence of zero before an integer or after a decimal does not make an otherwise correct answer incorrect.

As a rule it will be found quite satisfactory to have pupils exchange papers and do all the scoring themselves, the examiner calling the correct answers. If this is done, at least two pupils should score each paper, and the examiner should check the accuracy of the scoring for some of the papers.

How to Compute Pupil Ta (Total Ability in Arithmetic)

Find the pupil's total number of examples correct in the first column of Table I and read the corresponding Ta. This is the pupil's T score in arithmetic. Thus the first pupil in Table IV did 16 examples correctly, which, according to Table I corresponds to a Ta of 40.

TABLE I. CONVERSION OF "EXAMPLES CORRECT" INTO Ta SCORES

Examples Correct	Ta	Examples Correct	Ta	Examples Correct	Ta	Examples Correct	Ta
0	23	9	33	18	43	27	63
1	25	10	34	19	45	28	67
2	26	11	35	20	47	29	71
3	27	12	36	21	49	30	76
4	27	13	37	22	51	31	79
5	28	14	38	23	53	32	86
6	29	15	39	24	56	33	86
7	31	16	40	25	58	34	92
8	32	17	42	26	60	35	96

How to Compute Pupil Ba (Brightness in Arithmetic)[3]

Locate the pupil's solar age in Table II and read the corresponding Ba correction. If the Ba correction is plus, add it to the pupil's Ta. If it is minus, subtract it from his Ta. The result is the Ba. Thus, the first pupil in Table IV is 13 years 2 months old, which, according to Table II, corresponds to a Ba correction of —2. His Ta of 40 plus the Ba correction of —2 gives a Ba of 38.

[3] Both the symbol B and the essential idea are taken from the writings of Otis.

TABLE II. CONVERSION OF Ta INTO Ba

Solar Age	Add to T Score	Solar Age	Add to T Score	Solar Age	Add to T Score	Solar Age	Add to T Score
7—6	34	10—2	11	12—8	−1	15—2	−13
7—8	32	10—4	10	12—10	−1	15—4	−15
7—10	31	10—6	9	13—0	−2	15—6	−16
8—0	29	10—8	8	13—2	−2	15—8	−17
8—2	27	10—10	8	13—4	−3	15—10	−19
8—4	25	11—0	7	13—6	−4	16—0	−20
8—6	24	11—2	6	13—8	−4	16—2	−21
8—8	22	11—4	6	13—10	−5	16—4	−23
8—10	21	11—6	5	14—0	−6	16—6	−24
9—0	19	11—8	4	14—2	−7	16—8	−26
9—2	18	11—10	3	14—4	−7	16—10	−28
9—4	17	12—0	3	14—6	−8	17—0	−31
9—6	16	12—2	2	14—8	−9	17—2	−33
9—8	14	12—4	1	14—10	−11	17—4	−35
9—10	13	12—6	0	15—0	−12	17—6	−37
10—0	12						

How to Compute Approximate Solar Age

First, determine the pupil's lunar age and the lunar month of birth. Deduct 1 from his lunar age to get his basal age. Then from the number of the lunar month in which the tests are given, deduct the number of his lunar month of birth. If the resulting number is positive, add that number of months to his basal age to get his approximate solar age. For example, if the pupil is 15 years old and was born in the fifth month, and if the tests are given in eighth month, his basal age is 15—1 or 14 years, and the number of months is 8—5 or 3. Thus his approximate solar age will be 14 years 3 months.

In case the resulting number is negative, it means that the pupil is not up to the supposed basal age. Then from this age deduct the number of months deficient. Thus if a 15-year-old pupil who was born in the eleventh lunar month is tested in the eighth lunar month, his basal age is 14 but he is deficient by three months (8—11 = —3). So his solar age should be 14 years minus 3 months, that is, 13 years 9 months.

How to Compute Pupil Ca (Classification in Arithmetic)

Locate the pupil's Ta in Table III and read the corresponding Ga (Grade status in arithmetic). A Ga of 4.0, 4.5, or 4.9

means that the pupil has an ability in arithmetic equal to the average fourth-grade pupil at the beginning, middle, or end of the year respectively.

To convert a Ga into a Ca add to or subtract from the Ga the Ca correction shown below. Use the correction for the month when the test was applied. Thus the first pupil's Ta in Table IV is 40. According to Table III this Ta is equivalent to a Ga of 4.6. Since the test was applied December 10th this is nearest to the end of November, i.e., the third school month. The correction for the third month is +0.2 which added to the Ga yields a Ca of 4.8. Of course, the correction is the same for

TABLE III. CONVERSION OF Ta INTO Ga

Ta	Ga	Ta	Ga	Ta	Ga	Ta	Ga	Ta	Ga	Ta	Ga
22.8	2.1	42.4	5.1	58.6	8.1	63.8	11.1	72.5	14.1	84.5	17.1
23.6	2.2	43.0	5.2	58.9	8.2	64.0	11.2	72.9	14.2	84.9	17.2
24.4	2.3	43.6	5.3	59.2	8.3	64.2	11.3	73.3	14.3	85.3	17.3
25.2	2.4	44.2	5.4	59.5	8.4	64.4	11.4	73.7	14.4	85.7	17.4
26.0	2.5	44.9	5.5	59.6	8.5	64.5	11.5	74.1	14.5	86.1	17.5
26.8	2.6	45.5	5.6	59.9	8.6	64.7	11.6	74.5	14.6	86.5	17.6
27.6	2.7	46.1	5.7	60.2	8.7	64.9	11.7	74.9	14.7	86.9	17.7
28.4	2.8	46.7	5.8	60.5	8.8	65.1	11.8	75.3	14.8	87.3	17.8
29.2	2.9	47.3	5.9	60.8	8.9	65.3	11.9	75.7	14.9	87.7	17.9
30.0	3.0	48.0	6.0	60.9	9.0	65.4	12.0	76.1	15.0	88.1	18.0
30.7	3.1	48.6	6.1	61.0	9.1	65.7	12.1	76.5	15.1	88.5	18.1
31.4	3.2	49.2	6.2	61.1	9.2	66.0	12.2	76.9	15.2	88.9	18.2
32.1	3.3	49.8	6.3	61.2	9.3	66.3	12.3	77.3	15.3	89.3	18.3
32.8	3.4	50.4	6.4	61.3	9.4	66.6	12.4	77.7	15.4	89.7	18.4
33.7	3.5	50.9	6.5	61.5	9.5	66.8	12.5	78.1	15.5	90.1	18.5
34.4	3.6	51.5	6.6	61.6	9.6	67.1	12.6	78.5	15.6	90.5	18.6
35.1	3.7	52.1	6.7	61.7	9.7	67.4	12.7	78.9	15.7	90.9	18.7
35.8	3.8	52.7	6.8	61.8	9.8	67.7	12.8	79.3	15.8	91.3	18.8
36.5	3.9	53.3	6.9	61.9	9.9	68.0	12.9	79.7	15.9	91.7	18.9
37.3	4.0	53.7	7.0	62.1	10.0	68.1	13.0	80.1	16.0	92.1	19.0
37.8	4.1	54.2	7.1	62.3	10.1	68.5	13.1	80.5	16.1	92.5	19.1
38.3	4.2	54.7	7.2	62.5	10.2	68.9	13.2	80.9	16.2	92.9	19.2
38.8	4.3	55.2	7.3	62.7	10.3	69.3	13.3	81.3	16.3	93.3	19.3
39.3	4.4	55.7	7.4	62.8	10.4	69.7	13.4	81.7	16.4	93.7	19.4
39.6	4.5	56.0	7.5	62.9	10.5	70.1	13.5	82.1	16.5	94.1	19.5
40.0	4.6	56.5	7.6	63.0	10.6	70.5	13.6	82.5	16.6	94.5	19.6
40.4	4.7	57.0	7.7	63.1	10.7	70.9	13.7	82.9	16.7	94.9	19.7
40.8	4.8	57.5	7.8	63.2	10.8	71.3	13.8	83.3	16.8	95.3	19.8
41.2	4.9	58.0	7.9	63.4	10.9	71.7	13.9	83.7	16.9	95.7	19.9
41.8	5.0	58.3	8.0	63.6	11.0	72.1	14.0	84.1	17.0	96.0	20.0

all pupils tested on December 10th. For a school starting October 1st, December 10th is the second month, and similarly for other starting dates.

End of Month...	1	2	3	4	5	6	7	8	9	10
Ca Correction...	+0.4	+0.3	+0.2	+0.1	0	−0.1	−0.2	−0.3	−0.4	−0.5

How to Compute Class Ta, Ba, and Ca

The Ta for the class, grade, or group is the mean of the pupils' Ta's. In Table IV the class Ta is 48.2.

To compute the class Ba, first, compute the mean solar age for the class, second, convert this into a Ba correction by the use of Table II, third, add or subtract the Ba correction to or from the class Ta. Thus the mean solar age for the class in Table IV is 12 years, 2 months. According to Table II this solar age corresponds to a Ba correction of +2. When 2 is added to the class Ta, the resulting class Ba is 50.2 as shown in Table IV.

To compute the class Ca, locate the class Ta in Table III and read the corresponding Ga. Add to or subtract from the Ga the appropriate correction. Thus the class Ta of 43.2 corresponds to a Ga of 6.0. A Ga of 6.0 plus a correction of 0.2 for the third month gives a class Ca of 6.2.

TABLE IV. CHINESE FUNDAMENTALS OF ARITHMETIC SCALE, FORM 1

School No. 25 *Grade VI Down* *December 10, 1922*

Name	Solar Age		Ta	Ba	Ca
	Years	Months			
A	13	2	40	38	4.8
B	12	6	50	50	6.5
C	10	7	53	62	7.1
D	11	4	46	52	5.9
E	13	5	52	48	6.9
	12	2	48.2	50.2	6.2

How to Interpret Pupil Ta and Class Ta

The number of examples correct is not a satisfactory unit of measurement because the difference in difficulty between 30 and 31 examples correct may be greater or less than that between 10 and 11 examples correct. The difference between 30*T* and 31*T* or 28*T* and 29*T* always equals the difference between 10*T* and 11*T* or 55*T* and 56*T*.

Again, T scores make possible such statements as the following. Any pupil or class whose T is 50 has an ability which equals the mean ability of all twelve-year-old pupils. Any pupil or class whose T is 70 has an ability which is 20*T* (or 2 SD) above the mean ability of twelve-year-olds. Any pupil whose T is 35 is 15*T* (or 1.5 SD) below the mean ability of twelve-year-olds.

T scores may also be interpreted as shown in Table V.

TABLE V

A T Score of	Is Exceeded by the Following Percent of 12-year-olds	A T Score of	Is Exceeded by the Following Percent of 12-year-olds
25	99	55	31
30	98	60	16
35	93	65	7
40	84	70	2
45	69	75	1
50	50	80	0.1

How to Interpret Pupil Ba and Class Ba

The Ba norm is always 50 for all pupils. If a pupil's Ba is 50, his arithmetic ability equals the mean ability of all pupils of like age. He is of mean brightness. If his Ba is 40 he is 10*T* (or 1 SD) below the mean brightness in arithmetic of his own age group. According to Table V he is exceeded by 84 percent, not of 12-year-olds but, of pupils of his age. If his Ba is 75 he is 25*T* (or 2.5 SD) above the mean brightness in arithmetic of pupils of his age. According to Table V, he is extremely bright, since only 1 percent of his own age group are

brighter. In like manner the mean Ba for a class shows the brightness in arithmetic of that class as a whole as compared with the brightness of all other classes, not of like grade but of like age.

Thus both Ta and Ba are needed. Ta gives a measure of total arithmetic ability and incidentally shows how much each pupil or class Ta is above or below the mean Ta of twelve-year-olds. A Ta scale is used primarily for the purpose of measuring growth in ability from month to month and year to year.

But a nine-year-old pupil or class might have a Ta much below 50 and still be doing exceptionally satisfactory work. There is needed some score which makes allowance for the fact that a pupil or class is younger or older than twelve. The Ba correction automatically makes just this allowance; and the Ba shows pupil or class ability in comparison with pupils or classes of the *same* age. A young pupil may have a small Ta and a large Ba while an old pupil may have a large Ta and a small Ba. A pupil or class Ta grows larger from month to month and year to year, whereas the Ba changes little or not at all.

How to Interpret Pupil Ca and Class Ca

For a pupil to have a Ca of 3.5 means that he is an average third-grade pupil in the fundamentals of arithmetic. A Ca of 3.0 means that he barely belongs in the third grade. A Ca of 3.9 means that he is almost, but not quite, ready to be promoted into fourth-grade work in the fundamentals of arithmetic. A Ca of 6.4 means that he just fails of being an average sixth-grade pupil. The class Ca is interpreted similarly.

Since the pupils in Table IV are sixth-grade pupils their norm Ca is 6.5 and will continue to be 6.5 so long as they remain in Grade VI. It jumps to 7.5 as soon as promotion to the next grade takes place. The first pupil is 1.7 grades below norm. The second pupil is exactly at the Ca norm. The class is 0.3 *Ca* below the Ca norm.

Supplementary Diagnostic Scoring

On the front page of the test paper, write in the space after "Attempts," the number of the example circled by the pupil. This may be taken as a measure of his speed of work. Write in the space after "Rights" the number of examples done correctly inclusive of and prior to the example circled. A comparison of Rights and Attempts shows the percent of accuracy. Some pupils are slow and inaccurate, some slow and accurate, some fast and inaccurate, and some fast and accurate. Each type requires different treatment.

There are 20 examples for each of the four processes. Count separately the number of examples done correctly on each process, and write these scores in the spaces provided on the front page of the test paper. If the pupil has mastered each of the processes equally well his four separate scores should be approximately equal in size.

An even more helpful diagnosis can be secured by making out, or having the pupils make out, a table showing just what examples were missed or omitted by each pupil. From this the percent of pupils missing or omitting each example can be readily determined. Each pair of examples (1 and 2, 3 and 4, etc.) is built to test a pupil's mastery of a certain type principle or difficulty. As a rule, each pair of examples includes the difficulties of all preceding pairs and one additional difficulty. Two examples of each type are included because a chance error may cause a pupil to miss an example whose principle he has really mastered.

Once each pupil's need has been discovered in these ways, he can be given training on his specific weaknesses. A specially effective set of practice materials for giving this training is being prepared by the Nanking Committee for publication by the Commercial Press, Shanghai. Under no circumstances should a pupil be specially drilled on the particular examples of this test. The teacher who does this destroys the usefulness of the test as a measuring instrument.

Since diagnostic scores are intended for local use rather than for publication, tables have not been provided for scaling them.

Accuracy of Scale Scores

The accuracy of scale scores depends upon (1) the way in which pupils to be tested were selected, and (2) the number of pupils tested. The pupils tested were a random sampling from the total population in grades III through VIII in the government schools of Peking and Tientsin. The number tested was approximately 2,000.

MEASUREMENT OF THE EFFECTIVENESS OF DIFFERENTIATION OF HIGH-SCHOOL PUPILS ON THE BASIS OF THE ARMY INTELLIGENCE TESTS

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THE PROBLEM

The present study is an attempt to throw some light on the effectiveness of differentiating students into groups according to ability on the basis of a single intelligence test. The data for evaluating the effectiveness of such differentiation result from the giving of the Army Alpha Intelligence Test (Form 6); the Thorndike-McCall Paragraph Reading Test (Form 5); the Briggs English Form Test (Alpha); the Hotz Equation and Formula, and Problem Scales (Series A); and the Henmon Vocabulary and Translation Tests (II). These tests were given to 83 freshmen in one of the high schools of Michigan near the end of the first semester of the 1921-22 school year. While no differentiation actually took place in the high school concerned, for the purpose of this study it is assumed that the scores on the intelligence test given near the end of the semester are relatively the same as if given at the beginning of the semester and that the students are differentiated into three groups according to these scores. Group I consists of the 27 students making the highest scores; Group II, the 29 students making the next highest scores; and Group III, the 27 students making the lowest scores. The real problem then is to evaluate this assumed differentiation in terms of the results of the achievement tests.

Three distinct lines of evidence are submitted in the attempted evaluation: (1) the standards of achievement attained by the different groups; (2) coefficients of correlation between the scores on the Alpha test and on the various educational tests; and (3) the displacement manifest when the students differentiated into three groups on the intelligence tests are similarly

differentiated on the basis of the scores on the various educational tests.

The Standards of Achievement Attained by the Different Groups

Table I sets forth the median scores for the three groups on the Army Alpha Intelligence Test and on the various educational tests. The median score for Group I on the intelligence test is about 20 points higher than the median score for Group II, and the median for Group II is in turn about 20 points higher than the median for Group III. Thus a significant difference exists between the mental levels of the three groups. Consideration

TABLE I. MEDIAN SCORES FOR THE THREE GROUPS ON THE INTELLIGENCE AND EDUCATIONAL TESTS

	Number in Group	Army Alpha Intelligence Examination	Educational Tests						
			Thorndike-McCall Reading	Briggs English	Hotz Equation and Formula	Hotz Problem	Henmon Vocabulary	Henmon Translation	Composite
Group I..	27	124	32.4	28.2	6.0	5.6	17.7	1.6	89.0
Group II..	29	101	31.7	25.6	5.4	5.1	17.3	1.4	85.3
Group III.	27	81	28.8	24.4	5.2	3.8	15.7	1.0	73.8
Group as a whole..	83	101	31.4	26.2	5.5	5.0	17.0	1.4	84.4

of the results from the educational tests reveals that on the basis of median scores, Group I surpasses Group II, and Group II surpasses Group III. While it is true that the difference between the median scores of the different groups is not always large, it seems significant that the groups having higher median scores on the intelligence tests have correspondingly higher median scores on the achievement tests.

While there is a correspondence between the group scores made on the intelligence tests and on the achievement tests, examination of the individual scores portrays that the correspondence on the basis of individual scores is not perfect. A

few individuals with high scores on the intelligence test make low scores on some of the achievement tests. On the other hand, in some instances the reverse is true. In order to get a measure of the effect of this tendency the students are differentiated into three groups on the basis of each of the achievement tests in exactly the same manner as indicated for the intelligence test. The medians of the intelligence scores for these new groups were calculated. In compiling Table II the scores on each of the educational tests were ranked from highest to lowest. The first 27 students making the highest scores on the test in question were chosen for Group Ia, the 29 students making the next highest scores made up Group IIa, and the remaining 27 students constituted Group IIIa. The median scores on the educational tests for the various groups are entered on the upper line in each compartment of the table and the median intelligence scores on the lower line.

Table II portrays the interesting fact that the median score on the Army Alpha test is higher for Group Ia on any educational test than it is for Group IIa. The same statement holds in comparing Groups IIa and IIIa. This signifies that so far as group tendencies are concerned, high or low scores on the educational tests are accompanied by scores of corresponding rank on the intelligence test. This is the converse of the generalization earlier stated that groups with high or low median scores on the intelligence test achieve correspondingly high or low median scores on the educational tests. Thus, no matter whether differentiation is based upon the intelligence test or upon the different educational tests, these data show that intelligence and achievement go hand in hand.

The above generalization as previously pointed out is based upon comparisons of group scores. Table II furnishes some evidence that the generalization does not always apply to individual scores. For example, it will be recalled that the 27 students in the highest intelligence group (Group I) had a median intelligence score of 124 points. Table II, however, shows that when the division is made on the basis of the Thorndike-McCall reading

TABLE II. MEDIAN SCORES FOR THE THREE GROUPS CLASSIFIED ON THE BASIS OF EACH EDUCATIONAL TEST AND THE CORRESPONDING MEDIAN OF THE INTELLIGENCE SCORES FOR EACH GROUP

	Group Ia	Group IIa	Group IIIa
Thorndike-McCall Reading..	33.7	31.4	27.9
Army Alpha Intelligence....	111.7	103.1	86.4
Briggs English Form Test...	30.1	26.1	22.4
Army Alpha Intelligence....	111.7	103.1	91.0
Hotz Equation and Formula.	6.4	5.0	4.3
Army Alpha Intelligence....	115.0	97.9	91.0
Hotz Problem Test.....	6.9	4.9	3.3
Army Alpha Intelligence....	108.1	101.0	88.1
Henmon Latin Vocabulary...	20.5	17.1	12.4
Army Alpha Intelligence....	106.4	104.2	89.0
Henmon Latin Translation...	1.8	1.0	.7
Army Alpha Intelligence....	111.0	103.3	86.9
Composite Scores.....	93.1	84.4	73.3
Army Alpha Intelligence....	112.5	103.0	85.0

test, the 27 students in the best group (Group Ia) have a median intelligence score of only 111.7. This discrepancy is due, of course, to the fact that the intelligence test and the reading test do not put the same 27 pupils into the best group. Similar discrepancies will be noted when the best, medium, and poorest groups of Tables I and II are compared with reference to the other achievement tests. It is evident that the constituents of the three groups made on the basis of achievement tests are not the same as those of the three groups made on the basis of the intelligence test. This fact is also brought out by a consideration of differences between medians for adjacent groups. For example, according to Table II the difference between the intelligence of Groups Ia and IIa averages eight points, whereas when the best and medium groups are distinguished on the basis of intelligence tests, the corresponding difference is 23 points (Table I). Similarly, the difference between the intelligence of the medium and poorest groups according to Table II averages

about 12 points whereas the difference between Groups II and III is 20 points.

Correlation Between the Scores on the Army Alpha and the Educational Tests

The coefficients of correlation between the scores on the intelligence tests and the different educational tests exhibited in Table III range from 0.33 to 0.47 and signify a tendency for those who do well on the intelligence test to do well also on the educational tests. But this tendency is not marked and the fact that the coefficients are no higher suggest many exceptions. These coefficients of correlation ought to be especially significant since they are based upon the results of objective tests and are not subject to the usual subtleties of teachers' judgments.

Table III brings out the important fact that higher coefficients of correlation exist between the intelligence tests and the

TABLE III. COEFFICIENTS OF CORRELATION BETWEEN THE VARIOUS TESTS (PEARSONIAN)

	Thorndike-McCall	Briggs English	Hotz Equation and Formula	Hotz Problem	Henmon Vocabulary	Henmon Translation
Army Alpha	.45	.37	.42	.33	.41	.47
Thorndike-McCall		.21	.31	.30	.30	.22
Briggs English			.25	.28	.31	.22
Hotz Equation and Formula				.36	.24	.08
Hotz Problem					.25	.07
Henmon Latin Vocabulary						.33

various educational tests than between different pairs of educational tests. This is probably due to the fact that the intelligence tests tend to measure general ability and the educational tests certain phases of special ability. It suggests that the intelligence tests serve better for purposes of differentiation than any of the educational tests.

Displacement Manifest in the Grouping on the Basis of the Army Alpha and on the Basis of the Various Educational Tests

In the previous sections it has been indicated that the group tendencies and the correlations show that ability on the intelligence tests is accompanied with ability on the educational tests and consequently that differentiation on the basis of the scores on the Army Alpha Intelligence Test is reasonable. It has been indicated, however, that in making this differentiation there are cases where ability on the intelligence tests is not accompanied by similar ability on the educational tests. It is the purpose of this section to set forth the extent of this disagreement, which will be spoken of as pupil-displacement.

The evidence on the amount of pupil-displacement is exhibited in the form of histograms. In each of the histograms the heavy vertical lines mark the boundaries of the three groups when differentiated on the basis of the Army Alpha scores. It is noted that in each of the histograms the limits of Group III are from 40 to 89 points; of Group II, from 90 to 109 points; of Group I, from 110 to 171 points. Each square in the histogram represents an individual pupil. The lower figures in each square constitute the score on the Army Alpha; the upper figures, the score on the educational test concerned. The squares that are cross-hatched represent individuals whose classification on the educational test under consideration disagrees with the classification on the basis of the Army Alpha. The total number of these cross-hatched squares constitute the total amount of pupil-displacement.

Three different methods may be used in calculating the amount of pupil-displacement. The first of these methods, the one usually followed, consists in arranging the scores on the intelligence test in order of size, determining the number to be placed within each of the different groups, then arranging the scores on the educational test concerned in order of size, selecting groups corresponding in number to the groups selected on the basis of the intelligence scores, and calculating the percent of

students who are placed in different groups by the two methods of grouping. Figure 1 based upon this method of determining pupil-displacement shows that 53 percent of the students are placed in different groups when classified on the basis of the scores on Army Alpha and on the scores of the Hotz Problem Scale. The amount of displacement on the basis of the scores

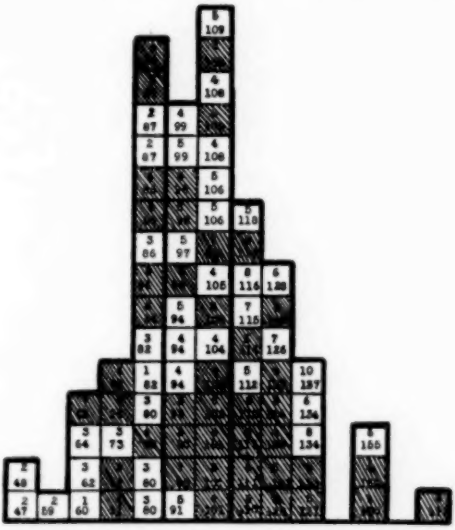

FIGURE 1. PUPIL-DISPLACEMENT BETWEEN SCORES ON THE ARMY ALPHA AND HOTZ PROBLEM TESTS—FIRST METHOD

on the Army Alpha and on the other educational tests varies from 50 to 56 percent, depending upon the particular tests concerned. This method, therefore, is only 10 to 15 percent better than would be obtained by a pure chance method.

There are two objections to this method of calculating displacement. The first objection lies in the fact that the dividing line between the groups is often not clear-cut and consequently chance often determines the division. In the particular case at hand if it had been decided to have 26 instead of 27 students constitute Group I, one of the two individuals making scores of 109 points would have been placed in Group I and the other in Group II. Chance probably would have determined the dis-

posal of these cases, but such disposition would have influenced the amount of displacement. The influence of chance is easily seen in Figure 1 in the differentiation on the basis of the educational scores. Several students solved 5 problems correctly but some of them are classified in Group Ia and some of them in Group IIa. The classification was determined by the order in which the students' scores happened to come rather than by the size of the scores. It seems to the writer that such procedure allows mere chance to have too much influence. The second objection to this method is that it does not take into account the amount of displacement. In the extreme cases the difference between the lower limits of the group just above and the upper limits of the group just below when classified on either the intelligence or educational tests may be no larger than one point or even one-tenth of a point. Yet this much variation in either score constitutes legitimate displacement by this method. Much of the displacement made manifest by this method is so small that it has little significance.

The second method of calculating the amount of displacement reduces the influence of chance to a certain extent and also takes limited cognizance of the size of the displacement. With this method no student is called displaced unless his score on either the intelligence or the educational tests concerned falls within a different class interval than the ones in which the dividing lines between the groups fall. Thus none of the individuals solving 5 problems would be counted displaced even though only 2 individuals are needed to make the total number corresponding to Group I. In this case 5 problems constitute the lower limit of Group Ia and the upper limit of Group IIa. Why should part of the students be displaced and part of them not displaced on the bases of this score? Certainly it is fairer to demand that a student's score be entirely outside the class interval containing the dividing line before recording a displacement. Figure 2, which exhibits the same facts as Figure 1, calculated by the second method, shows a reduction in the amount of displacement from 53 percent to 35 percent. With the other educa-

tional tests the amount of displacement calculated by this method varies from 30 to 36 percent. These figures mean that if differentiation is made on the basis of the Army Alpha scores, relatively two-thirds of the students are satisfactorily grouped and one-third unsatisfactorily grouped. Great gains in the effectiveness of differentiation are thus manifest by a very small change in the method of calculating pupil-displacement. But

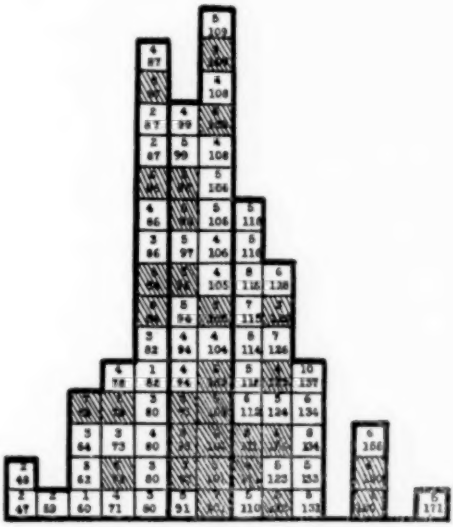

FIGURE 2. PUPIL-DISPLACEMENT BETWEEN SCORES ON THE ARMY ALPHA AND HOTZ PROBLEM TESTS—SECOND METHOD

even yet much of the displacement represents very small differences in the actual scores on either the Army Alpha or the educational tests.

The third method of calculating pupil-displacement stresses the student's score in relation to the median score of the group immediately above or below. Accordingly, no student will be called displaced unless his score is higher than the median score of the group above or lower than the median score of the group below. This method of calculating displacement is the one which should appeal to the practical superintendent for it means

that displacement is not based so largely on chance and it guarantees that the amount is sufficient to warrant a new classification. Consequently, it is the contention of this paper that the effectiveness of differentiation can be evaluated only in terms of pupil-displacement when it is calculated in this manner.

Figure 3, giving the same data as given in Figures 1 and 2 but calculated by the third method, reveals that the amount of displacement is only 19 percent. Figures 4, 5, and 6 represent

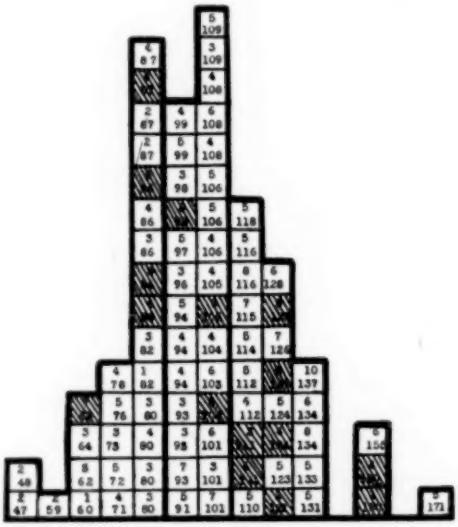

FIGURE 3. PUPIL-DISPLACEMENT BETWEEN SCORES ON THE ARMY ALPHA AND HOTZ PROBLEM TESTS—THIRD METHOD

typical classifications on the basis of the scores on the Army Alpha and various other educational tests. These figures and other similar ones not reproduced show that the amount of displacement when calculated by the third method is usually about 20 percent. Thus 4 out of every 5 students when differentiated on their scores on the Army Alpha are so placed within the 3 groups that there is no cause for reclassification. Such differentiation is sufficiently satisfactory to warrant its use. It is no sporting chance, as it wins 4 out of every 5 times. With all its success, however, provision should be made so that this one out

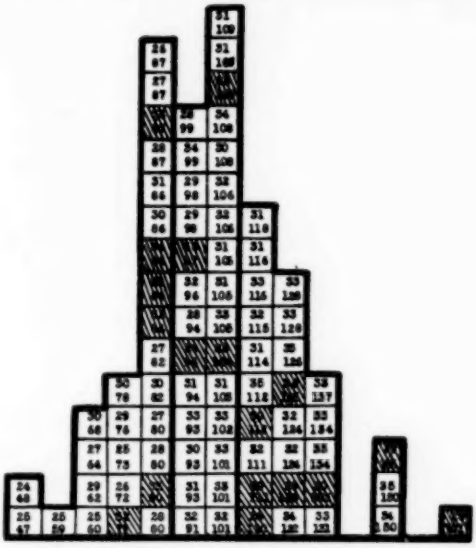

FIGURE 4. PUPIL-DISPLACEMENT BETWEEN SCORES ON THE ARMY ALPHA AND THORNDIKE-MCCALL READING TESTS —THIRD METHOD

FIGURE 5. PUPIL-DISPLACEMENT BETWEEN SCORES ON THE ARMY ALPHA AND HENMON LATIN VOCABULARY TESTS —THIRD METHOD

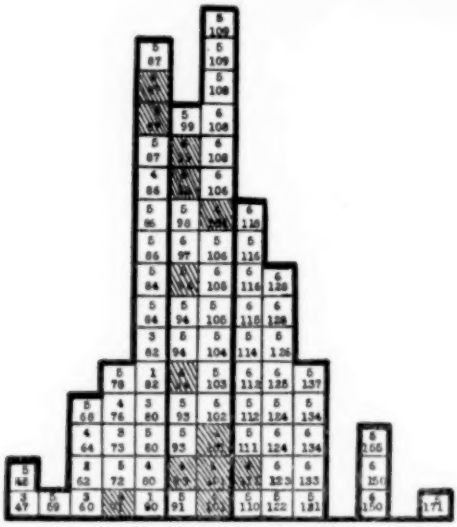

FIGURE 6. PUPIL-DISPLACEMENT BETWEEN SCORES ON THE ARMY ALPHA AND HOTZ EQUATION AND FORMULA TESTS —THIRD METHOD

of the five students who is not properly classified can be placed with a group manifesting achievements more nearly like his own.

Thus, the third method of calculating pupil-displacement leads to the same conclusion manifest in the other sections of this paper, viz., that ability on the intelligence test tends to be accompanied by a corresponding ability on the educational tests or vice versa. Since this conclusion seems to be established by comparison of the median scores on the educational tests for Groups I, II, and III, by comparison of the median scores on the Army Alpha for Groups Ia, IIa, and IIIa, by the correlations between the scores on the Army Alpha and the educational tests, and by the amount of displacement when calculated from a practical and common sense point of view, it is reasonable to assume that differentiation on the basis of the Army Alpha scores in the particular high school concerned could have taken place in a surprisingly effective manner. Undoubtedly the differentiation would have been even more effective if cognizance had been

taken of the pupils' previous records and all other available information. It is recommended that this be done if possible; but if it is not possible, this study indicates that differentiation on the basis of the scores on the Army Alpha (and by inference any other equally good intelligence test) can be used satisfactorily for grouping together students of homogeneous abilities.

ADEQUATE COST ANALYSIS AS A BASIS FOR BUDGET MAKING[1]

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With the mounting cost of education the public is demanding more adequate cost analysis of school expenditures. The public has a right to know in greater detail about the costs of education, and these costs need to be indicated in such terms as will enable the public to judge whether or not money is being spent wisely. This calls for a method which makes possible comparisons among institutions doing the same sort of work. School officials should welcome this demand. Only by meeting the demand squarely can we retain entire confidence of the public in the efficient financial management of schools.

While the majority of readers will be interested primarily in public education of elementary and secondary school grade, nevertheless all are interested in the success of the financial battles which colleges and universities are fighting. This paper is concerned with a study of costs in one university, namely, the University of Kansas, for the year 1921-22. I have chosen to give this concrete illustration rather than to discuss general principles because I hope that helpful criticism may result from this account of an imperfect attempt at cost analysis. When a more perfect plan is worked out I trust that universities whose problems are similar may adopt some universal plan of cost accounting that will make comparison from institution to institution possible.

In a university study of cost we must face two questions: first, what is the most useful unit of cost to use; and second, what items shall be admitted into the total cost? Under the first problem two units have been suggested, either the student-clock hour or the student-credit hour. Certain institutions have made use of each unit in studies which have been previously

[1] A paper read before the Administrative Research Section, Educational Research Association, March 1, 1923.

made. The Joint Board of Higher Curricula in the state of Washington, for example, has made use of the student-clock hour and its studies are among the most valuable ones available to date. The student-clock hour means an hour spent in either recitation, lecture, or laboratory by a student without regard to the credits in the course for which that hour is a part. The student-credit hour, on the other hand, has to do with the credit in the course without regard to the amount of time which the student spends in recitation, lecture, or laboratory for unit of credit. My own preference is the student-credit hour and that has been the basis for the study which I shall report. I favor the student-credit hour because the product of college education is designated in credits. A standard college if organized on the half-year plan expects thirty credits per year for four years. Therefore the credit hour is a uniform fraction of the requirements of college graduation. What we are interested in measuring is the cost of higher education, therefore our unit should be some definable fraction of that education. The fact that a credit hour will probably call for more clock hours in a laboratory science than in a subject like economics means that the laboratory science will probably be found to be more costly per credit hour, but that is no reason for using the clock hour as the basis and thereby having no way after all of measuring the cost of college education for the reason that no uniform number of clock hours is required for graduation.

Whether this argument be sound or not, the following study is reported in terms of a student-credit hour, which means 1/120 of the graduation requirements of the typical college of liberal arts, or 1/30 of the typical registration of the college student for a year. In practically all colleges, courses are designated in terms of credit hours and a student's enrollment is for the number of credit hours involved in all the courses for which he is enrolled.

For the second question, what items should be admitted into the total cost, the only entirely correct answer is to admit all items which are actually involved. There is, however, so much uncertainty regarding the amount which should be allowed for

deterioration on buildings, for interest on investment, and for the fraction of the capital outlay that it has seemed to me wisest for the present to exclude these items entirely and include only the following: (a) salaries, (b) general maintenance, (c) special maintenance, and (d) overhead.

A brief definition of these items is necessary.

Under salaries is included the salaries of all the instructional staff in so far as their time is devoted to instruction or administration chargeable directly to instruction in a given department; and of all the assistants such as storekeepers, stenographers, and the like, needed in the administration of the department.

Under general maintenance is included the cost of all equipment and supplies which may be used by student after student, such as microscopes, balances, and the like.

Special maintenance is used to cover all the costs of materials which are used up by students, such as chemicals, cooking materials, etc. In many institutions these supplies are secured from a revolving fund maintained from laboratory fees of students.

Under overhead are grouped three rather distinct types of expenditures: (1) general university administration offices, such as the president's, the registrar's, the bursar's, the deans' of men and women, the deans' of colleges, and general university activities such as gymnasium, athletics, museums, etc.; (2) buildings and grounds department, including heat, light, water, janitor service, and general upkeep of the campus; (3) library, including the allotment for books as well as the cost of maintaining the library staff.

In allocating these various items to the several departments careful account was taken as to fractional parts of salary devoted to instruction in the case of teachers not devoting full time to instruction in any given department. Also the fractional part of the time of teachers devoted to general university business rather than to administration of a given department was assigned to general university overhead. In distributing overhead costs the following method was used: The costs of administration were distributed among the departments in proportion to the

student-credit hours. The costs of services such as heat, light, and janitor services were distributed to the departments in proportion to the floor space occupied by the departments. The library costs were distributed in proportion to the amounts allotted to the various departments for books during the year.

On the above basis I may now give certain findings as to cost per student-credit hour in the University of Kansas for the year 1921-22.

TABLE I. STUDENT-CREDIT-HOUR COSTS AT UNIVERSITY OF KANSAS

Large Divisions	Costs (dollars)
Law	5.97
Arts and Sciences	7.41
Education	11.70
Engineering	14.01
Pharmacy	14.21
Medicine	19.41
Whole University	8.74

From Table I it will be observed that the cost per student-credit hour in the university as a whole is $8.74 and in large divisions it ranges from $5.97 in law, to $19.14 in medicine. It thus appears that it costs more than three times as much per unit for medicine as it does for law. It costs almost twice as much for engineering as for arts and sciences. Please understand that no criticism is implied in this range of costs.

The percent of cost for the following items are:

Instruction salaries . . . . . 57 percent
General maintenance . . . . . 6 percent
Special maintenance . . . . . 3 percent
Overhead . . . . . 34 percent

It thus appears that the cost of general administration, the buildings and grounds, the library and such general activities as the gymnasium, athletics, museums, and the like, is 34 percent of the total cost of education. Salaries directly chargeable to instruction account for 57 percent, while the general maintenance

and special maintenance items are but 9 percent. It would be interesting indeed to have figures from other similar institutions with which these percents might be compared.

In the interest of brevity and simplicity the following Tables II, III, and IV are confined to data for the departments which make up the College of Arts and Sciences in Kansas.

TABLE II. STUDENT-CREDIT-HOUR COSTS, NON-LABORATORY DEPARTMENTS, UNIVERSITY OF KANSAS

Non-Laboratory Departments	Costs (dollars)
Economics	4.02
Political Science	4.65
Mathematics	4.77
History	4.88
Sociology	5.22
Spanish	5.70
Public Speaking	6.22
Philosophy and Psychology	6.51
English	6.66
French	7.96
Journalism	8.88
German	8.99
Ancient Languages	12.46
All Departments	5.90

In Table II we note the wide range of difference among departments of instruction which on the surface might seem to be quite comparable. Leaving out the two languages at the most expensive end of the scale, and omitting journalism, also, which is in a sense laboratory, we find here that economics at $4.02 per student-credit hour is practically but half of the cost of French at $7.96 per student-credit hour. The average of all non-laboratory departments is $5.90 per student-credit hour, while the average of all laboratory departments shown in Table III is $10.72 an hour—182 percent of the cost of non-laboratory departments or one and four-fifths times as costly. It will be observed in Table III that the costs of laboratory departments range from $7.47 in geology to $17.76 in bacteriology.

Without implying any criticism I wish to call attention to certain comparisons which Tables II and III make possible.

TABLE III. STUDENT-CREDIT-HOUR COSTS, LABORATORY DEPARTMENTS, UNIVERSITY OF KANSAS

Laboratory Departments	Costs (dollars)
Geology	7.47
Home Economics	8.81
Physics	9.13
Botany	9.39
Zoology	10.69
Entomology	11.00
Chemistry	12.00
Physiology	12.68
Bacteriology	17.76
All Laboratory Departments	10.72
All non-Laboratory Departments	5.90

Chemistry is for example, almost three times as expensive as the departments of economics, political science, mathematics, or history. The biological sciences are more than twice as expensive in general as the sociological sciences. Before entering upon a discussion of the questions raised by these data I wish to offer in Table IV the student-credit-hour costs for buildings, including heat, light, janitor services, and the like.

From Table IV it will be observed that the amount of room required by the sciences in comparison with the non-laboratory

TABLE IV. STUDENT-CREDIT-HOUR COSTS FOR HEAT, LIGHT, JANITOR SERVICE, ETC., UNIVERSITY OF KANSAS

Non-Laboratory Departments	Costs (dollars)	Laboratory Departments	Costs (dollars)
History	.23	Geology	.83
Economics	.35	Entomology	1.08
Sociology	.39	Home Economics	1.13
English	.45	Physiology	1.65
Spanish	.48	Physics	1.71
Political Science	.48	Botany	1.93
Mathematics	.49	Bacteriology	1.97
Philosophy and Psychology	.58	Zoology	2.37
French	.62	Chemistry	2.57
German	1.08		
Journalism	1.11		
Public Speaking	1.35		
Ancient Language	2.07		
All	.54	All	1.89

departments shows even a greater disparity than the total student-credit-hour costs. As an illustration, the three social sciences, history, economics, and sociology, cost on the average less than 35 cents per student-credit-hour for care of quarters, while chemistry costs $2.57, or seven times as much. It will be observed that the average of all the science departments is $1.89 per student-credit-hour, while for the non-laboratory departments it is but 54 cents, less than one-third as much. In other words, science departments require more than three times as much building space in the University of Kansas as do non-laboratory departments per unit of credit taught. Therefore, if depreciation of buildings and interest on investment were included in the total costs the difference between the cost of the science departments and the non-science departments would be considerably greater than the difference revealed in the above tables.

Time will permit consideration of only a few of the questions which the above data raise. The following are among the most obvious. Has the laboratory method of instruction demonstrated its superiority over the non-laboratory method to the extent that we are willing to pay practically double the cost for it? The laboratory method was introduced in high schools and colleges at a time when costs of education were not as formidable a problem as they now are. Science departments cannot but feel the challenge to demonstrate that their method is necessary in order to secure the main values from their courses. To bring out the question somewhat more clearly, suppose that instead of having students assigned to readings from textbooks or library references, in the department of economics, instructors were provided with assistants who divided the economics classes into small groups and helped them with the problems raised in the economics lectures and in their books. How much more effective might the economics instruction become? A fairly adequate corps of assistants could be provided without raising the cost of instruction in economics to the level of the laboratory sciences. If even the introductory courses in the various sciences were handled without the laboratory method, it is conservative

to estimate that the cost of the science departments would be reduced $50,000 in the University of Kansas.

Please do not conclude that I am assuming *that the laboratory method is not worth its cost.* I am indicating only that justification for the method is more urgently demanded when it is noted how relatively costly it is.

A second general question raised has to do with discovering the element most instrumental in determining cost. The above table reveals that law in the University of Kansas costs $5.97, the cheapest of all the university divisions. Nevertheless, the faculty of the law school are the highest salaried members of the staff on the average and they teach a smaller number of periods per week on the average than does any other division in the university. Their small cost is due almost entirely to the fact that their classes are uniformly large. Their curriculum is fixed and therefore there are no classes offered for relatively small numbers. The high cost of other divisions is not due primarily to high salaries of teachers nor to small number of hours of teaching, but rather to the fact that highly differentiated curricula have resulted in teachers devoting their time to relatively small numbers in their classes. The question naturally arises as to what extent this is sound educational policy.

The third question has to do with student fees charged. In the University of Kansas the special maintenance fund is largely secured through student fees and the money is made a revolving fund to pay for the materials used. The larger cost of the laboratory sciences, however, is not primarily in the materials used by the students. This special maintenance fund is only 3 percent of the cost of instruction while the laboratory departments of the college cost one and four-fifths times as much as the non-laboratory departments on the average. The rather general assumption that the laboratory fees compensate for this difference in cost is therefore not true. If fees are intended to make good the difference in cost of laboratory as against non-laboratory departments, they would have to be made many times greater than they are in any institution about which I happen to

have information. Again I do not wish to be understood to advocate the collection from students of fees sufficient to make up the difference in cost between laboratory and non-laboratory departments, but I am saying that the collection of fees on the basis of materials used does not exactly achieve what its advocates ordinarily claim.

The most interesting aspect of this cost-analysis study concerns the use which is made of the data in preparation of the following year's budget. At the University of Kansas when the annual budget is being prepared, there is a budget committee consisting of the Dean of Administration as chairman, the head of the department whose budget is under consideration, and the deans of the schools in which credit from that department is allowed towards graduation. This committee reports its recommendations to the chancellor of the university, who of course is the final authority on the budget which is presented to the State Board of Administration. The data on cost analysis are presented before the budget committee in the following form: (1) Tables showing the unit costs of the items of (a) salaries, (b) maintenance, and (c) overhead for all the departments in the university. (2) For each department separately a graph representing the student-credit hours taught in that department each year for the past half dozen years, and the cost of the department per student-credit hour in comparison, first with the group of departments most nearly comparable with it; second, with the large university division of which it is a part; third, with the university as a whole. (3) Much other data such as size of classes, teaching load, etc., are at hand.

The growth of the department, its relative cost in each of the items making up the total, as well as the total cost per student-credit hour is thus immediately apparent. If a department shows a low cost its request for more teachers or more maintenance or higher salaried teachers, is considered in the light of its standing in the several items making up the cost. If, on the other hand, a department's costs are high, consideration is given to what the consequences would be of a reduction of the staff, or a staff with

lower salaries, a reduction of maintenance, etc. Out of these considerations come, of course, an inquiry into the number of small classes being maintained, whether or not classes cannot alternate from year to year, whether the staff consists too largely of high-salaried teachers, and the like. Information upon all of these points, of course is assembled previous to the hearing of the budget committee.

It is too early to undertake to give much as to the results of the use of this cost analysis in budget-making at the University of Kansas since we have followed the practices here outlined but two years. I think, however, it is safe to say that two very significant results have been achieved: first and most important, members of the faculty are much better satisfied about budget allotments. Everything is now open and above board, and each department sees itself and its needs in terms of the needs of other departments. Necessary restrictions are much more cordially accepted, and unusual increases are much more adequately defended. A fairer leveling up of costs, and therefore of opportunities, is possible in the light of these data than would be possible without them.

The second result of importance is an attitude on the part of faculty people which demands a careful examination of all the curricula to ascertain whether or not the costly courses and costly methods are justified. Care is exercised not to assume that all departments should be maintained at an equal cost, but the more costly departments are feeling the necessity of defending their cost.

Other results of minor significance may be cited. Because of the extremely expensive overhead for buildings in the chemistry department, there has been devised a form of chemistry desk for the students which occupies but half the space which the old desk occupied. Some of the laboratories have already been fitted up with these desks and in general by this means the number of students who can be accommodated any given term by the laboratory space has been doubled.

Above all, the possession of facts such as this study makes available gives to the university administration a confidence with which it can meet the problems of cost as they are presented from the board of control, or from the state at large. We are expecting that this confidence will bear fruit in a willingness on the part of the people to support higher education as they would not be willing otherwise to support it.

THE PREDICTION OF TEACHING SUCCESS

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The criterion for any professional school is the successful future participation of its students in the profession with which the school is concerned. For a teacher-training institution, the criterion is teaching success after graduation. It is the purpose here to discuss briefly three methods for the determination of this criterion through the use of tools and materials easily available in any typical situation.

The state must know—and the efficient state normal-school administrator must find out for the state—what value as teachers the *groups* found in its teacher-training institutions have. In addition to this every state normal-school administrator must know what value each *individual* in the teacher-training group has. These two types of facts may be determined for a teacher-training group and for any individual in the group *before* the state has spent much in the way of money, time, and human energy. It is unnecessary to point to the intrinsic value of such a procedure.

DETERMINING THE TEACHING VALUE OF THE GROUP

A number of methods of foretelling the performance of groups of students have been suggested. One of the earliest was that of Dearborn.[1] Thorndike and others have repeatedly investigated the significance of the tests given by the College Entrance Examination Board. By these methods, however, answers are furnished, as a rule, merely in terms of the performance of the median student or of the student located at some point in the distribution. Moreover, the various items on which prediction is based are usually given equal weights. The discussion

[1] Dearborn, W. F. *The relative standing of pupils in the high school and the University of Wisconsin.* (Bulletin No. 312) Madison, Wisconsin: University of Wisconsin, 1909.

of methods of analysis of functions previously published[2] shows that this is a faulty basis for procedure. No group of variables in a realm of concomitance acts in that manner.

It is found that a truly scientific expression of the relative weight or value of items in any correlating group results from the use of the method of partial correlation. If one wants to know the value of the *entire* group of items (independent variables) in reference to the criterion (dependent variable), the best way to combine the elements and to express this group value is by means of R, the coefficient of *n*-fold or multiple correlation. It is understood that R is the correlation of all of the independent variables in a group with the criterion considered. Any other method of combining them for prognosis would disregard their relative weights.

In this paper *teaching success* is the criterion. In setting up our formulae and in writing equations we regard this as the dependent variable and refer to it as variable number one. Six other items are used as independent variables. They are (2) *intelligence*, (3) *secondary record*, (4) *academic record*, (5) *professional record*, (6) *student teaching*, and (7) *physique*. In the technique used in this paper the numbers attached to these variables are often used as subscripts. In such connections, "1" always refers to *teaching success*, "2" to *intelligence*, etc. For example, r_{12} means the coefficient of correlation between teaching success and intelligence.

Some familiarity with the usual notation system of multiple and partial correlation must be assumed. For example, the R-value referred to above is written $R_{1.234567}$. It is the correlation between the first variable, teaching success, on the one hand; and on the other hand, the six remaining variables combined. Yule[3] offers two ways of calculating this value. Each leads to the same result, the difference being in the order in which the material is handled. One of the two formulae will be sufficient to

[2] Whitney, F. L. "The analysis of teaching functions," *Journal of Educational Research*. 7:297-308, April, 1923.

[3] Yule, G. U. *Introduction to the theory of statistics*. London: Charles Griffin and Company, 1919. p. 248ff.

illustrate the nature of the procedure. The one in which the subscripts increase in natural order is

$$R_{1.234567} = [1-(1-r^2_{12})(1-r^2_{13.2})(1-r^2_{14.23})(1-r^2_{15.234})(1-r^2_{16.2345})(1-r^2_{17.23456})]^{\frac{1}{2}}$$

The coefficients of zero order on which the computations required by this formula were based were used both in raw form and as corrected for attenuation. The details, especially those related to the discovery of a criterion in terms of which coefficients were corrected, are not presented in this paper.

These calculations give answer to the question, What is the value of a prediction of future performance in teaching on the basis of the six independent variables used? The answer is $R_{1.234567} = 0.589$ (0.592 corrected). Errors of sampling here have not as yet been discussed authoritatively. As R is always positive, it is subject to biased error. Yule has suggested a tentative measure of its root mean square value, but admits that it is probably too severe.[4]

This is a first process of evaluation of teacher-training material and efforts. It is possible in any state normal school where measurements of functions similar to those above are available and where the department of educational psychology can be given authority to do the checking. Care must be taken, of course, to refine all measures used so that real relationships may be closely approximated and to see that in the intercorrelation table the independent variables are more closely correlated with the criterion than among themselves.

Determining the Teaching Value of the Individual

Prognosis of teaching success for individual state normal-school graduates may be on the basis of but two variables, the criterion itself and an independent variable chosen from among those available. For example, let us suppose that (3) *secondary record* and (1) *teaching success* have a relationship such that $r_{13} = 0.391$.

[4] Yule, G. U. "Theory of correlation for any number of variables treated by a new system of notation." *Proceedings of the Royal Society of London, Series A.* Vol. 79, 1907.

Now, if we desire to express probable teaching success as inferred from secondary record, we shall seek some factor by which the latter may be multiplied to produce the former. In other words, we shall seek the value of b in the regression equation $x_1 = b\,x_3$. In this equation b is the regression coefficient. It is computed from the appropriate value of r and the standard deviation (σ) of each variable, according to the formula $b_{13} = r_{13}\frac{\sigma_1}{\sigma_3}$. If teaching success is so distributed that its standard deviation (σ_1) is 4.6, and if the standard deviation for secondary record (σ_3) is 4.2, then b, the desired regression coefficient, is $0.391 \times \frac{4.6}{4.2}$, or 0.426. This means that teaching success equals 0.426 times secondary record, or that $x_1 = 0.426\,x_3$. But since x_1 and x_3 are deviations from the central tendencies respectively of teaching success and secondary record, a more useful form of the equation will be $X_1 = 0.426\,X_3 - 6.2$. Where X_1 and X_3 are not deviations from central tendencies but actual amounts of the variables. The resulting prediction—i.e., the resulting value of X_1—is subject to a certain error. The usual formula for the so-called root mean square error of estimation gives 4.2 in this case.

With this equation, then the secondary record of any individual student may be used to determine the most probable score in future teaching success which his secondary record will yield. For example, in one of the twelve state normal schools cooperating in this study, student number thirteen who had the median secondary record (86) would, according to this formula for prognosis, teach when under contract on a level of success represented by the rating of 30.4 (maximum 38). By inquiry, it is found that her superintendent actually gives her a rating of 34. Since the root mean square error of estimation amounts to 4.2, no real discrepancy is found in this particular prediction.

But it will be recognized that there are many other determiners of future teaching success besides the level of attainment in the student's high-school experience. Very probably *every* item of personal equipment and of past life experience has served

in some way to determine what the future performance in a real teaching situation will be. It would appear that as many of these as can be expressed in terms of amount must be used, if prognosis is to be valuable. Pearson, however, points out that the number of variables used is not so important a consideration as a proper arrangement of relationships among them.[5]

Fortunately, the method of partial correlation makes possible the writing of a regression equation which includes not simply one of the independent variables, but as many as can be handled with facts available and time at one's disposal. In this study, the six independent variables given above are used; and the coefficients of regression, obtained through calculation, give true expressions of the relative weight of each.

This regression equation takes the general form,

$$x_1 = b_{12.34567}x_2 + b_{13.24567}x_3 + b_{14.23567}x_4 + b_{15.23467}x_5 + b_{16.23457}x_6 + b_{17.23456}x_7$$

If this is written in terms of central tendencies for sigmas and as deviations from the mean scores for the entire group of twelve state normal schools comprising 1200 students, it becomes

$$x_1 = .004x_2 - .038x_3 - .115x_4 + .915x_5 + 1.403x_6 - .085x_7$$

When transferred to raw scores of individual students this equation becomes

$$X_1 = 23.218 + .004X_2 - .038X_3 - .115X_4 + .915X_5 + 1.403X_6 - .085X_7$$

Here, as in the case of the simpler regression equation of two variables above, actual scores for any individual student may be inserted among the independent variables, and upon summation the right side of the equation becomes a prediction for his level of teaching success after graduation. For example, student number one in cooperating School F has measures for the independent variables as follows: (2) *intelligence*, 80; (3)

[5] Pearson, K. "On certain errors with regard to multiple correlation occasionally made by those who have not adequately studied the subject." *Biometrika*, 10:181-87, April, 1914.

secondary record, 89.4; (4) *academic record*, 8.7; (5) *professional record*, 8.5; (6) *student teaching*, 8.6; and (7) *physique*, 9.0. Substituting these values in the last regression equation, teaching success becomes 38.2. Actual teaching skill for this individual, as judged by his superintendent, was 38. This is well within any amount of standard error to be expected, which in this case is 4.47.

Narrowing the Field of Prediction

But it is very probable that a tool for prognosis like that above, which is based upon the medians obtained from a number of teacher-training institutions widely scattered, may not be successfully used in each individual school. The ideal will be to carry cooperative research to the point where such a generalized expression for the proper weights of all items found in the environment of teacher training may be discovered and used. For the present it will be safer to write the regression equation for any individual school, and then use it in that school. This has been done for School F, and the regression equation in terms of amount on the basis of mean scores in this school is

$$X_1 = 9.821 + .004X_2 - .038X_3 - .115X_4 + .915X_5 + 1.403X_6 - .085X_7$$

Trying this equation for prediction with three cases selected by chance, and noting that the standard error of estimate is 4.47, we find that for student number 2, the obtained score is 24.4, the actual rating 29, and the discrepancy 4.59; for student number 66, the obtained score is 26.3, the actual rating 32, and the discrepancy 5.7; and for student number 35, the obtained score is 26.4, the actual rating 21, and the discrepancy 5.4.

It is seen that the actual discrepancy in each case is close to the amount of standard error which might be expected and which could be allowed for. Within its own realm, then, the regression equation makes possible individual predictions of value when it is desired to know what success any incoming student will probably have as a teacher after graduation.

Prediction at Matriculation

It is possible to use data available at any stage of progress in preparation for teaching and to make prognosis of future teaching success upon those bases. Undoubtedly, the most critical point is when the question must be answered, Shall this particular applicant for matriculation be admitted to teacher-training privileges? Here the variables available are (2) *intelligence,* (3) *secondary record,* and (7) *physique;* and these may be used at once to predict teaching success in answer to the question proposed. This is illustrated in School J, and the following regression equation results:

$$X_1 = 15.517 - .008X_2 + .145X_3 + .253X_7$$

Two students in School J were selected at random. Their ratings in intelligence, secondary record, and physique were substituted in this equation. The resulting prediction as to teaching success was, for one of these students, 29 (actual success rating 31), and for the other 29.7 (actual rating 32). That is, it is possible in any teacher-training institution, where the skill of the educational psychologist approximates that of the vocational psychologist in the employment office of a business corporation to proceed at once to evaluate the raw material which the institution is accepting from the secondary school.

Predictions upon Admission to the Training School

Another critical point of progress in preparation comes when the question must be answered, Is it worth while to admit this student to actual student teaching opportunities in the training school? In the typical situation, this point is at the beginning of the second year of residence. Five items for prognosis are then available. These are (2) *intelligence,* (3) *secondary record,* (4) *academic record,* (5) *professional record,* and (7) *physique.* When these are used, the regression equation for School A becomes

$$X_1 = 28.52 - .011X_2 - .015X_3 - .536X_4 + 1.024X_5 + .036X_7$$

Applying this equation to three chance individual cases, it is found that for student 1, the prediction is 30.8, actual rating 30,

discrepancy 0.8; for student 2, the prediction is 30.3, actual rating 30, discrepancy 0.3; and for student 43, the prediction is 31.2, actual rating 34, discrepancy 2.8.

But, for a student who is about to undertake student teaching under supervision in the training school, it is possible to say also, within reasonable limits, what his performance in student teaching will be. In this calculation, of course, (6) *student teaching* becomes the dependent variable or criterion, and the independent variables are, as above, (2) *intelligence*, (3) *secondary record*, (4) *academic record*, (5) *professional record*, and (7) *physique*. The regression equation for School A in terms of these variables is found to be

$$X_6 = 9.068 - .053X_2 + .014X_3 + .382X_4 + .098X_5 + .093X_7$$

Applying this equation to the data for a number of students in School A, it is found that for student 52, the prediction is 8.9, actual rating 8.6, discrepancy 0.3; for student 29, the prediction is 10.3, actual rating 10, discrepancy 0.3; for student 20, the prediction is 8.8, actual rating 7.6, discrepancy 1.2; and for student 22, the prediction is 8.1, actual rating 9.6, discrepancy 1.7.

This discussion has suggested what is thought to be a more scientific method of prognosis both for groups and for individuals than any yet proposed for teacher-training institutions. The value of the group as a whole may be determined in terms of the general level of teaching efficiency they will probably attain after graduation. The future worth of any individual student may be calculated also either for probable success in student teaching in the training department or for actual ability under contract after graduation. Individual prognosis is illustrated under four typical conditions. All of these point to the value of studying intensively the realm of correlating factors in the single school and of basing predictions upon relationships among these factors. It is suggested that the formulation of a truly generalized regression equation in this field be left to later cooperative research.

A STUDY OF THE BINET AND TERMAN INTELLIGENCE TESTS WITH ELEVEN-YEAR-OLD CHILDREN

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Because of the time required in giving the Binet tests in the public schools, a satisfactory group intelligence test has been much desired by administrators. When carefully given, the Binet requires from thirty to fifty minutes for each child examined, while it is possible to give a group test to one hundred or more children at one time within the same period. With so many intelligence tests crowding for recognition, the question of validity is of vital importance. One factor in judging a group test is a good correlation with some well-established test. With this in mind the present research was carried on. The intelligence examinations used were the Stanford Revision of the Binet scale and the Terman Group Test of Mental Ability, Form A. The problem[1] was to discover how well the Terman group test correlated with the Stanford Revision and in so doing to obtain any helpful additional information which might result.

CONDITIONS

The tests were given in the public schools of Fort Collins, Colorado, a town of about nine thousand people located in the principal agricultural section of the state. It fairly well represents an unselected group. The examination was limited to eleven-year-old children, who were tested regardless of the grade in which they were. This age was chosen because there is a maximum attendance of eleven-year-old children in any school system. Since the age of school entrance is six years, most of the children should normally have been in the sixth

[1] The data for this report were collected by Mrs. Annie Gage and Miss Florence Spencer, two members of the advanced psychology classes at Colorado Agricultural College. Mention should also be made of the hearty cooperation of Superintendent A. H. Dunn of Fort Collins.

grade. Eleven-year-old children were found, however, in every grade from the first to the eighth.

By definition, eleven-year-old children were those whose ages ranged from eleven years to eleven years and eleven months, inclusive. The Terman group test was given first. Each child was then examined individually by the Stanford Binet scale. Nearly two hundred children were tested, but because of absences only 164 were given both examinations. The Binet tests were always given privately in a quiet room—factors that have not been sufficiently observed, especially in juvenile court examinations. Some of the children were later re-examined by the writer. The difference in score was slight, in no case over three or four points. The examinations began March 1, and continued until June 1, 1921.

Nine of the 164 children examined could scarcely read or write and made practically no score in the Terman examination. Their results, therefore, could not be used. The scores of the remaining 155 children were correlated by the Pearson Product Moment Formula with the following results: $r = 0.80$, P.E. $= \pm .019$. This is a very creditable and satisfactory correspondence. In Table I the median Intelligence Quotients of the six schools of the city, both in the Stanford Binet scale and the Terman test, have been ascertained. The schools were placed in rank order, which is the same for each of the tests. For school buildings this gives a Spearman rank order coefficient of 1.[2] This again indicates how good a forecast of the Stanford Binet score may be obtained by the use of the Terman Group Test. For the benefit of those who desire to study individual scores, Table II is presented. This table shows for each of the 164 eleven-year-old pupils the sex and the Terman and Stanford scores.

It was discovered that the inferior and average children were located on the whole in about the grades in which they belonged. This was not so true of the superior children. Where the teacher's recommendation favored it, most of them were later promoted.

[2] Not, of course, to be taken as the correlation based on indiviual scores.

TABLE I. THE MEDIAN INTELLIGENCE QUOTIENTS OF EACH SCHOOL IN BOTH TESTS

Building	Stanford Binet		Terman	
	Rank	Median I. Q.	Rank	Median I. Q.
Laurel	1	105.3	1	111.95
Laporte	2	100.0	2	104.3
Remington	3	97.8	3	104.15
Washington	4	94.2	4	101.1
Lincoln	5	92.5	5	100.7
Franklin	6	91.4	6	98.08

Observations and Conclusions

1. This research indicates that for a group of eleven-year-old children the Terman Intelligence Test, Form A, gives a correlation of 0.80 with the Stanford Binet. It has proven an excellent instrument for the mental classification of these children for it readily separates the average from the superior and subnormal. It can be used with confidence in making a general survey of such a group. Special cases to which attention has thus been drawn may later be examined individually by the Stanford Binet. These correlations are higher than those which have been obtained between the Stanford Binet and certain other individual examinations.

2. The Terman Intelligence Quotients, calculated from the norms obtained in March, 1921, are slightly higher than those of the Stanford Binet.

3. The group test in a few instances seemed to excite certain children more than the Stanford. This would naturally be the case with any group test.

4. The test, repeating four digits backwards, in the ninth year caused certain difficulties. It was passed as well by the children having a Stanford I.Q. below 90 as by those from 90 to 110. Drawing designs from memory in the tenth year was passed by one-half of the children with I.Q.'s below 80, but the

two who ranked highest in the entire examination failed on it. Whether this would continue with a greater number of cases is, of course, a question. The tests, arranging five weights and

TABLE II. INTELLIGENCE QUOTIENTS OBTAINED FROM TERMAN AND STANFORD BINET EXAMINATIONS OF 164 CHILDREN

No.	Sex[b]	Intelligence Quotients		No.	Sex[b]	Intelligence Quotients		No.	Sex[b]	Intelligence Quotients		No.	Sex[b]	Intelligence Quotients	
		Terman	Stanford Binet			Terman	Stanford Binet			Terman	Stanford Binet			Terman	Stanford Binet
1	G	152.	139.3	42	G	113.8	114.2	83	G	103.5	100.	124	G	94.	98.9
2	B	148.7	120.8	43	G	113.8	86.8	84	B	103.5	90.5	125	G	93.9	67.8
3	B	143.6	132.4	44	G	113.7	110.3	85	B	103.1	94.4	126	G	93.2	85.8
4	B	140.2	132.3	45	G	112.7	98.5	86	G	102.9	105.8	127	G	93.	88.8
5	B	136.6	116.9	46	G	112.2	100.	87	G	102.9	89.6	128	B	92.8	87.3
6	B	135.2	112.9	47	G	111.2	108.6	88	G	102.8	93.5	129	B	92.8	96.4
7	B	132.8	121.1	48	B	110.7	103.5	89	B	102.6	97.9	130	G	92.7	81.8
8	B	132.2	104.8	49	B	110.7	83.9	90	G	102.3	80.5	131	G	92.2	90.2
9	G	132.2	119.9	50	B	110.5	103.5	91	G	102.3	97.9	132	B	91.8	78.5
10	B	131.4	118.1	51	B	109.9	100.	92	G	101.6	105.1	133	G	91.4	79.4
11	B	130.8	114.2	52	G	109.8	112.9	93	B	101.1	100.	134	G	91.3	84.
12	G	130.1	124.3	53	G	109.4	118.8	94	G	100.7	96.6	135	B	91.1	88.2
13	B	127.6	108.	54	G	109.3	87.9	95	G	100.7	94.2	136	B	90.8	88.2
14	B	127.	114.1	55	G	108.4	87.7	96	B	100.7	84.9	137	G	90.7	81.5
15	G	126.9	111.8	56	G	108.1	104.2	97	B	100.7	90.	138	G	90.5	72.7
16	G	126.5	125.2	57	B	107.8	97.7	98	G	100.2	85.8	139	G	90.5	83.
17	B	126.3	115.4	58	G	107.4	92.5	99	B	100.	100.	140	B	90.3	101.4
18	G	126.	120.9	59	G	107.1	105.6	100	G	100.	70.9	141	B	90.2	85.4
19	B	125.6	117.1	60	G	107.1	103.3	101	B	99.6	99.1	142	B	89.8	78.3
20	B	124.	110.	61	G	106.7	87.7	102	B	99.6	94.2	143	B	89.7	87.
21	G	123.7	115.3	62	G	106.3	98.9	103	G	99.2	86.5	144	B	89.7	78.7
22	B	123.3	112.7	63	B	106.3	94.3	104	B	99.	92.8	145	B	89.5	92.4
23	G	121.8	124.2	64	B	106.0	88.7	105	G	98.9	104.3	146	B	89.2	88.3
24	B	121.5	111.6	65	G	105.8	99.6	106	B	98.8	96.2	147	G	89.1	78.2
25	B	121.1	124.8	66	G	105.3	88.	107	B	98.7	111.9	148	G	88.9	81.5
26	B	120.5	128.8	67	B	105.3	87.2	108	B	98.6	89.4	149	B	87.9	97.7
27	G	119.4	119.1	68	B	105.3	102.1	109	B	98.1	91.4	150	G	87.2	76.5
28	G	118.6	113.6	69	G	105.2	96.9	110	B	98.0	89.4	151	B	85.2	78.1
29	B	118.5	109.6	70	G	105.2	109.5	111	G	97.7	77.4	152	B	85.1	71.1
30	G	118.4	100.1	71	B	105.2	94.9	112	B	97.7	102.8	153	G	84.6	81.8
31	G	117.1	104.2	72	B	104.9	98.9	113	B	97.5	91.8	154	B	82.0	81.8
32	G	116.4	104.3	73	G	104.8	96.2	114	B	97.3	90.2	155	G	81.	58.3
33	B	115.9	95.4	74	G	104.7	86.4	115	B	96.2	84.9	156	B	(7)[a]	72.7
34	G	115.8	107.5	75	B	104.6	102.8	116	B	95.8	92.4	157	G	(6)	89.1
35	G	115.4	109.5	76	G	104.5	119.6	117	B	95.5	82.9	158	B	(2)	67.7
36	B	115.2	107.4	77	G	104.5	102.2	118	G	95.4	100.5	159	B	(1)	86.2
37	B	115.1	93.9	78	G	104.4	101.4	119	B	95.3	95.7	160	B	(1)	81.
38	B	115.	98.5	79	B	104.3	87.7	120	B	95.2	90.5	161	B	(0)	67.7
39	G	114.5	96.3	80	B	104.2	102.7	121	B	94.5	95.6	162	B	(0)	67.
40	B	114.4	109.4	81	B	104.1	100.7	122	G	94.5	79.6	163	B	(0)	61.2
41	G	114.2	104.9	82	G	103.9	98.5	123	G	94.0	77.4	164	G	(0)	66.2

[a]Numbers 156-164 could hardly read and write and were therefore not included in the correlation.

[b]G and B indicates girl and boy.

using three words in a sentence, both in the ninth year proved to be particularly difficult for a number of the children. The latter test showed somewhat the effect of school training. Two children, one with a Stanford I.Q. of 58 and the other 61, who had been admitted to school at an early age and who had been

given a considerable amount of additional training, gave correct responses to it while some average and superior children failed.

5. It is not necessarily true that a child who has passed all of the tests in one year will pass all of those in the year below, although this is found to be true for the majority.

6. The highest and lowest Intelligence Quotients in the Stanford Binet were those of girls. The coefficient of variation[3] for boys is 13.3 and for girls 15.2.

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[3] Pearson $V = \frac{1000}{M}$

Editorials

COMING TO AN UNDERSTANDING

The N. E. A. has a group of people whose collective title may be called "interesting if true." It is named the Commission on the Coordination of Research Agencies. The appointment of this commission illustrates the nonchalant manner in which big undertakings are, in the good American way, enjoined upon committees or commissions.

It happens, however, that this commission with the flamboyant title and the big job has been taking its work rather seriously. It showed not only its seriousness, but its acumen when it subdivided its labors. It created among other subordinate groups a committee to which it gave the task of bringing some organization into the handling of educational materials. By "materials" we mean particularly educational writings.

Now to devise a scheme for handling educational writings is certainly a large and important undertaking. How often have we been disappointed in our effort to find material on a given topic. We may have been looking for it in a public or institutional library which ought to have something on our topic and probably has. Ten to one, however, the topic was not set up in the card index. The fact is that the really modern movements in education are not represented in the current schemes of classifying and indexing. Under these circumstances, every library or bureau which would do anything to bring order out of the chaos into which the printing of many books in education has plunged us must devise some kind of a home-made scheme for its own use. But a home-made scheme, by its very nature, is unsatisfactory. It may not even serve the purpose within the organization which uses it. It will certainly be of no assistance when the

organization comes in contact with other organizations having similar purposes. If a certain office is weak in material on "elimination" and another is strong in material on that topic, the first office can not secure the cooperation of the second and be sure that the two offices are using the same language. The second organization may be using the heading "persistence" instead of "elimination." This might lead it to report that it had nothing on elimination.

It is clear that we need something to help us in the handling of the large amount of printed and duplicated matter which the well-supplied educational library must have. Since the librarians have not supplied this deficiency and since the publishers of indexes cannot be aroused to the importance of an educational index, the N. E. A. commission has done well to move in the direction of supplying the need. Its committee to which this task was given is now issuing a tentative list of subject headings. It is being placed in the hands of a few educational people and librarians who have agreed to cooperate in its revision. It seems likely, therefore, that we shall soon have, through the wisdom of this N. E. A. commission, something that will enable a worker in education to find what any library has to offer on any important educational topic—provided the library in question is using the approved list of subject headings. This list of subject headings will also enable different bodies of educational people to do their indexing cooperatively. One office or library, for example, may agree with several others to divide the work, to duplicate the cards, and to furnish each cooperating agency with copies of the cards. Thus one office may index the publications of a particular bureau; another, the bulletins of learned societies; a third, the reports of foundations; a fourth, the reports of city school systems; etc. In this manner, a task which is perhaps too big for any one office may be handled on the principle that "many hands make light work."

Another possibility which a good list of subject headings brings into view is an educational index in published form. Such an index might be issued fortnightly or monthly, and accumulated from the beginning of the year every three months. Sub-

scribers to the index could thus have a ready made bibliography on any of the topics contained in the fundamental list of subject headings. Perhaps such an index would have to be subsidized. At least the commercial indexers seem unwilling to undertake the task.

Be that as it may, we find in the work which the N. E. A. commission has started one important element in the coordination of research agencies. In virtue of it we may be brought to a closer understanding of our common problems.

B. R. B.

THE WILL TO LEARN

The psychology of purpose is attracting no small attention, and deservedly so. Few ideas are more fruitful or rest upon more unimpeachable experimental evidence. In the article, "The Will to Learn" by Book and Norvell we have an instance of the extent to which purposes control our activities.

We have known for a long time that practice with knowledge of results produced greater progress than practice without such knowledge. Important pedagogical lessons are derivable from this fact. We find it not only pleasanter but more effective to take a pupil into our confidence and to relieve the dull plodding to which his ignorance of progress will condemn him by keeping him informed not only as to his objectives but as to his movement in the direction of the objective.

Somewhat different, though still within the realm of purposes, is the matter of the will to learn. It appears that if a person believes he *can* learn, his attitude and his procedure definitely favor his doing so. On the other hand if he becomes convinced that he cannot learn, then the evidence is that he does so only with the greatest difficulty or not at all. This is probably the condition when a person is "arrested" at a plateau. We all have our plateaus —our periods when progress halts and interest flags. Bryan's telegraphers at "Podunk" and Kitson's printers, with just skill enough to hold their jobs are on a plateau. Perhaps you and I in our golf or tennis or French are on a plateau; and probably the will to learn and a belief in its possibility are the only condi-

tions that will save the situation. Time and again it has been shown experimentally that when folks think they can develop no further, behold, they do not develop further. But if some set of circumstances alters their belief or if some person in whom they have confidence tells them that their limit of improvement has not been reached, they again advance.

Herein lies one of the advantages of measurement in education. It enables us to set before learners what others like them have done. It enables us to set goals before them which are neither remote nor yet actually within their grasp. It enables us to be specific and concrete instead of general and abstract.

Our application, therefore, of the doctrine of purpose, and especially our quickening of the will to learn, will be tremendously more effective now that we are able to supply the definite, personal, and inescapable incentives which our test materials so largely afford. Moreover, we may arouse and maintain interest, sustain the confidence of the learner, win his continuous effort in the learning process, and either postpone his next plateau or enable him to break through it to a level of skill or competence which without these incentives may never be reached.

Reviews and Abstracts

Report of the Survey Staff to the Board of Education of Augusta, Maine. Augusta, Maine: Kennebec Journal Print Shop, 1922. 242 pp.

The Augusta survey centers around two special problems, the working out of an adequate building program and the reorganization of the Augusta system of education. The survey, however, covers a much wider range. The method used, except where statistics were already available, as in the case of attendance, grade distribution, and rate of promotion, was observation rather than measurement.

The buildings were carefully examined with the aid of the Strayer-Engelhardt Score Card for City School Buildings rather than rated by it. The inadequacies of present plants are pointed out in detail and specific changes recommended for each building. On the basis of the probable population growth and the probable school population increase due to a greater holding power of a reorganized system of education, a definite building program is suggested. Sites are selected which will meet the needs of this reorganized system, suggested for Augusta and the surrounding rural territory included within the city limits.

The system of education recommended in place of the present 9-4 organization and a group of one-teacher rural schools is a kindergarten and 6-3-3 organization. This is to include the rural schools surrounding Augusta and consolidation is advised for the first six grades, where transportation to the urban schools is impracticable. The conveyance of pupils beyond the sixth grade to the proposed Augusta junior high school is also suggested.

The curricula of both the elementary schools and the high schools are analyzed in detail and specific changes suggested. For the high school it is advised that the present curriculum, dominated both in content and method by college preparatory requirements, be thoroughly revised to meet present day requirements. Attention is called to the need of a better program for health education and adequate facilities for play and medical inspection.

In dealing with the question of grading and promotion, the individual progress made by each of 160 pupils who entered the first grade in 1909, was traced throughout their school careers. The lack of data from a program of psychological and educational testing renders the discussions of the problems of school progress and grade distributions of pupils less adequate, of course, than would otherwise have been the case.

Among other outstanding recommendations made by the Survey Commission are a definite salary schedule with increased salaries for professional preparation and for successful experience to increase stability in the teaching staff, which is especially lacking in the high school; the encouragement

of further professional preparation on the part of the teachers in service; and the introduction and use of the psychological and educational tests.

The report, although based largely on observations, sets forth the actual conditions found in the Augusta system of schools tactfully as well as specifically, and advises a definite building and reorganization program that is clearly shown to lie within the financial ability of the citizens of Augusta to carry out.

M. J. VAN WAGENEN

University of Minnesota

ROSS, CARMON. *The status of county teachers' institutes in Pennsylvania.* Philadelphia: The University of Pennsylvania, 1922. 168 pp.

Doctor Ross has made a very thorough study of the status of Pennsylvania county and district teachers' institutes. Source material for the study included the school laws of Pennsylvania and other states; bulletins; articles in educational periodicals; and replies to questionnaires sent to county superintendents, district superintendents, supervising principals, teachers, departments of public instruction, and prominent educators.

It is shown that Pennsylvania institutes were established in the middle of the last century for the purposes and under circumstances which are rapidly passing out of existence. Inasmuch as they still retain to a considerable degree their earlier characteristics, as shown, for example, by a preponderance of "inspirational" addresses on the programs, they are condemned as inefficient.

We are constrained to say after weighing carefully the facts revealed by this study, and especially the deficiencies of the program, the high cost of the institute compared with the product, the lack of organization to make effective the wisest use of time, the isolated and disconnected features of many programs, that the opportunity to make the most out of the institute has not been fulfilled; that in spite of the many valuable features of the institutes and their service to public education in the past, they are not functioning efficiently today as agencies in the practical *in-service* and *after-training* of teachers. We believe, therefore, that the facts justify the conclusion that according to the accepted principles of efficiency, county teachers' institutes in Pennsylvania are, in a measure, and in many counties, inefficient (p. 154).

Summarizing the opinions of those most concerned, the institute should not be abolished. Short, carefully prepared programs, partly sectionalized, dealing with present-day problems in education with consequent reduction in "inspirational" addresses, and having some unity with past and future programs, will render a real service.

An index and separate chapter summaries would improve the monograph. More careful proof-reading would have avoided the errors in foot-note numbers which annoy the reader in Chapter I and the evident mix-up of material on pages 72 and 75.

If the report reaches the proper educational officials it should be influential in effecting improvement. A follow-up study a few years hence, showing the monograph's effect upon the school people of Pennsylvania, thousands of whom were involved in the study, would be interesting.

R. L. MORTON

Ohio University

NORMAN, JAMES WILLIAM. *A comparison of tendencies in secondary education in England and the United States.* (Teachers College, Columbia University, Contributions to Education, No. 119) New York: Teachers College, Columbia University, 1922. 186 pp.

Dealing with the two countries whose "problems are not identical," but whose "hopes and aspirations for the future of democracy are the same" (p. 1), this book immediately becomes of interest as a means of throwing a clearer light upon our common educational problems. The author never allows the reader to lose sight of the fact that the two nations have the same aims, but, because of their different political, industrial, and social conditions, they are approaching these aims from different directions. Both have need for a clearer understanding of the meaning of secondary education in a democracy; both have gone further with their educational objectives than they have with means for attaining them; both are studying their problems critically and making slow but sure progress; but both face grave problems. "England needs to retain her ideal of breadth, but at the same time reach the individual child. The United States in reaching the individual child needs to remember that richness of experience is best conducive to growth" (p. 169). Both are effecting noteworthy reorganizations; but one is basing them upon the relative values of various subject matters, while the other is founding them upon objectives and group differentiation. "In England the aim is to train leaders, the brightest pupils being selected wherever they may be found for secondary education. In the United States the aim is to develop the whole mass of the people with the expectation that leaders will emerge" (p. 174).

A hasty reading of this volume will give the impression that it is merely an enumeration of statements that might be listed under either "England *and* America" or "England *versus* America," and that it is only a compilation of the views of influential American and English educators. It does both of these well; but it does much more. It states convincingly the reasons for both the similarities and differences in administration, selection, and organization of subject matter, and educational methods in the two nations' systems of schools. "The comparison of principles shows why" (p. 175) is Professor Norman's watchword. In developing comparisons and contrasts he emphasizes the fact that educational aims and methods are not only interrelated, but that both are inextricably bound up with sociological and philosophical national attitudes.

The volume contains single chapters pertinent to courses in the principles of secondary education, educational administration, the adolescent curriculum, vocational education, and methods of teaching; but the fact that these problems are interrelated and that all are linked up with a nation's social vision makes the volume valuable as a reference in any course in education or sociology.

EARL HUDELSON

University of West Virginia

CHARTERS, W. W. *Curriculum construction.* New York: The Macmillan Company, 1923. 352 pp.

This book represents a thorough-going effort to point the way for constructive reorganization of the curriculum, particularly of the elementary type. Mention is made of the inadequacy of the age-old practice of defining educational aims and ideals, which are impotent of themselves to modify practice. We need the aims and ideals but we must supplement them by an analysis of activities. The final program must provide for the functioning of ideals in daily activity. It is not honesty in the abstract which is wanted, but a practical honesty which will keep the clerk from robbing the cash drawer; not courtesy in the abstract, but a courtesy which works out into deference to the aged, removing the hat in the presence of ladies, etc. A careful analysis of activities discloses the actual needs of the social situation, catalogues the errors or weaknesses of the untrained performer, and so leads naturally to the effort to supply the useful information and training.

Among the forces opposed to practical procedure of this kind are (1) the prestige of systematic knowledge, and (2) formal discipline. These forces are very powerful and well intrenched. Formal discipline has been and still is the best stronghold of a useless subject. Minor forces are the limitations of the teacher and the incompetence of the author. Both tend to follow custom and to deal with information which has been thoroughly systematized. Systematic knowledge is always more or less a record of the past, not a solution of present problems. In the words of the author the proposed plan of the text is to show that the following rules may be laid down for the construction of the curriculum:

First, determine the ideals and activities which constitute the major objective; second, analyze these and continue the analysis until working units are obtained; third, arrange them in order of importance; fourth, raise to positions of high rank in these lists those ideals and activities which are of great value for children even though low in value for adults; fifth, determine the number of most important ideals and activities which can be mastered in the time allotted to school, after eliminating those which can be learned outside of school; sixth, collect the best practices of the race in teaching these ideals and activities; and seventh, arrange the material in proper instructional order, according to the psychological nature of children and the texture of the material.

Part II (pp. 169-344) consists of a digest and criticism of the scientific studies which have been made in the field of the curriculum. Since many of these studies are no longer available, this part of the work is exceedingly valuable. It places in the hands of school people generally, the materials which in many cases have been open only to departments of education. A total of fifty-six investigations are listed and then studied in their proper connections.

"Curriculum Construction" should be very stimulating to teachers, supervisors, and administrators. The schools are given a new function and a new viewpoint. No longer are they to be mere dispensers of accumulated information, but henceforth active agents of the community in defining aims and formulating ideals, in analyzing activities and noting shortcomings in their

performance, in gathering and organizing new information, and in applying information new and old to the solution of present-day problems.

G. M. WILSON

School of Education, Boston University

MONROE, W. S. *The theory of educational measurements.* New York: Houghton Mifflin Company, Riverside Press, 1923. 364 pp.

This book, in its summaries of general facts and underlying theories, fills a real need in the field of educational measurements. Hitherto there has been no single reference to which students or persons interested could be directed to gain an understanding of this movement and if they were directed to the source materials they became woefully lost in the maze of details.

The book begins with an excellent discussion of the beginnings of standardized objective tests in which the author traces the development of many of the ideas which are so well known to present users of the tests and scales. Chapter II sets forth the nature and meaning of educational measurements and states the underlying assumptions. Chapter III presents the distinction between general intelligence and specific ability tests, between achievement and prognostic tests, and includes a discussion of the uses of measurement in administrative and supervisory activities, in instruction, and in research. Chapter IV, on the construction of educational tests, will be welcomed by amateurs in measurement for it gives a very clear statement of the requirements to be met and of the processes involved in test construction. Chapters V and VI, on the performance of pupils, exhibit the theory underlying the type of responses to be expected and discuss the significance of the various performances. Chapter VII presents the argument for a common unit of measurement, describes and criticises McCall's proposal to scale all tests in terms of the variability of achievement of 12 year-olds and Pintner's proposal to scale the tests in terms of the variability of each age group. This chapter also discusses the significance of the Intelligence Quotient and the Efficiency Quotient. Chapter VIII defines and classifies norms and suggests the uses which can be made of these if correctly established. Chapter IX presents an outline for making a critical study of a test and devotes much space to the method of determining the reliability and validity of a test. It appears to the reviewer that if criteria proposed are applied to existing tests and scales that all will be found seriously wanting. The next chapter on "Using Standardized Educational Tests" gives helpful suggestions for administering a testing program and for utilizing the test results after the measurement has been made. These suggestions ought to be helpful to superintendent, supervisor, and teacher. Chapter XI deals with relationship of the standardized tests to the ordinary examination and with suggestions for improving the latter. The remainder of the book is devoted to such statistical method as is needed by workers in the field of measurement.

This book calls attention to many facts often overlooked by advocates of measurement. It is filled with real discussion and is in no sense a description of widely used educational tests. The writer has no hesitation in recom-

mending this book for use in advanced classes in educational measurements and for the reader who has already some knowledge of the general field.

CLIFFORD WOODY

University of Michigan

PARKER, SAMUEL CHESTER. *Types of elementary teaching and learning.* Boston: Ginn & Company, 1923. 575 pp.

This book will fill a unique place, not only as a textbook, but as a book for the professional study of teachers and supervisors in the elementary field. It is conspicuously characterized by detailed accounts of observations of the work of some of the most highly skilled teachers in the country. These examples of teaching are frequently so refined in technique that they will interest and aid very experienced teachers; yet they are so simply described that they will benefit the inexperienced student. Such illustrations do for the reader what he is often unable to do for himself for want of constructive imagination acting upon a background of rich experiences of the higher type. These specific descriptions of actual classroom procedure are supported by scientific evidence which interprets the methods used and furnishes the background of principles upon which all sound teaching is based.

Throughout, the author endeavors to keep before the student the organization of the book as a whole, each part thereof and each chapter. This is done by an introductory statement of the main points of the chapter and by occasional summaries tying together the associated topics and illustrations. The bibliographical references at the close of each chapter are well organized and invite further study and investigation on the part of the student or reader.

The style is appealing because the author addresses the reader as directly as though he were speaking in the classroom. For example, after using the subtitle "Liberal Elementary Education," he says in bold type, "Don't be scared by the subtitle," and then proceeds to develop the chapter in a simple, direct manner.

The author treats the entire field of elementary subjects and method. Part I deals with "Four Elementary Skills"—handwriting, spelling, reading, and arithmetical calculation. Here is given a digest of the more recent investigations and the best-known methods in connection with each of the subjects under consideration. Chapter V, "Beginning Reading," is one of the most concrete and valuable contributions ever made on this subject. Part II, comprising over half of the book, deals with "Four Thoughtful Processes" and offers an able treatment of the importance of understanding social life and of acquiring insight into contemporary civilization. There follows a treatment of the means by which the pupil's experiences may be broadened and enriched through content and method. Part III, "Recreational and Moral Behavior," stimulates the reader to a fuller appreciation of the teacher's responsibilities for the next generation of citizens.

Altogether, we have in this book a text which deals with well-evaluated topics in the study of elementary teaching and learning. It provides the

various types of teaching with a concreteness which not only interprets them, but which should fix them in the mind of the student.

MYRTLE L. KAUFMANN

Elementary Supervisor, Logansport, Indiana

DICKSON, VIRGIL E. *The use of mental tests in school administration.* (Monograph No. 4, June, 1922.) Berkeley, California: Board of Education. 1922. 44 pp.

Educational statistics turns upon itself to show progress and validity in an unusual monograph by Dr. V. E. Dickson of the Oakland-Berkeley schools. Have I done what I set out to do? Is the scientific premise implicit in the organization of a Bureau of Reference and Guidance well-founded? Does it lead to a discovery of truth which may be used in guiding the authorities of a school system in its development and reorganization toward wholesome effectiveness? The answer, so far as Berkeley is concerned, is well-delivered in three chapters, "What has been accomplished?" "Administrative Problems calling for much needed change," and "An Education 'Fourteen Points.'"

The writer has recently availed himself of an unusual opportunity to compare the workings of departments of research in the principal cities of the country. While some departments have focalized chiefly upon financial and administrative problems the Berkeley department gives a clear and full description of its attack upon an unusually wide range of important instructional problems.

Chapter II presents, in six sections, some important data on the subject, Are Binet tests really prognostic? An actual survey of promotions of the children leads to the following conclusions:

1. 77.8 percent of children made progress as predicted (slow, normal, or rapid).
2. Of 12 cases of disparity (between test and actual progress) all but 2 can be explained on the basis of absence, illness, or unsatisfactory home conditions (teachers' judgments).
3. Therefore, of predictions made at the first grade, of the progress to be made during four years—96 percent either were realized in the school life of the child or failed of realization through some known factor other than mental capacity of the child.

Tests and promotion system measured against each other are here presented. But the exceptional prognostic reliability shown must not be taken as an indication of corrected conditions. In so far as the tests and promotions were administered without transfer of knowledge from one to the other, it is clear that the Berkeley classroom teachers can judge, with remarkable accuracy, the mental ability shown regardless of achievements and sometimes they promote accordingly. In contrast (p. 29) it appears that (of 76 special cases for study) at the end of two years only 46.3 percent were correctly placed at work suited to their mental age, 17.6 percent were pushed on because of over-age and size, while 7.8 percent under-age mentally had been passed because of application, excessive help, personality, and social status. Perhaps the Berkeley principal, like some other principals in California, was forced

to equate classes, fill up seats, placate teachers, or parents, or in other ways meet the school needs as a good administrator should. And here we have come upon the exact source (99.4 percent pure) of school ills as roughly shown in age-grade tables, of the mental stultification of bright teachers and pupils, of the enormity of neglect of dull pupils forced to sit and pretend to work at incomprehensible problems day after day, year after year.

Doctor Dickson has worked out an excellent series of special classes (Atypical, Limited, Opportunity, and Accelerated) as helps in correcting the condition. Each type of room has a definite objective and each pupil is assigned there because that particular room is the one place he needs to go. They are not ungraded dumping grounds—but effective school instruments.

Many other important contributions are packed in small compass in this monograph.

A. H. SUTHERLAND

Department of Psychology and Research, Los Angeles

NUTT, WILBUR HUBERT, *Principles of teaching high-school pupils.* New York: The Century Company, 1922. 359 pp.

"What's in a name?" A name should connote something; it should be expressive of character and filled with meaning. My first reaction to Professor Nutt's book is that it is well named. It is a thesis on just what the name implies; that is, principles of teaching high-school pupils. Every chapter of the eleven has a direct bearing on the subject under consideration. These pages are vibrant with fundamental, constructive principles underlying the teaching process.

In the introductory chapter the author demonstrates that he is capable of clear thinking. He places the emphasis in teaching where it belongs. He exalts the learner and makes the subject matter a means to that end. It is in such statements as "it is the function of the teacher to stimulate the mind of the learner to react effectively to subject matter," and "it is what goes on in the mind of the pupil that educates him," that we catch the spirit of the book. His enumeration of the principles which should guide teachers in their teaching of high-school pupils is a terse outline of what follows. It is in this chapter that he emphasizes the importance of teacher training and demands practice teaching of those entering the service. "The need today is for more and more practical study of the actual teaching situations . . . . ample knowledge of theory and application of theory must be brought together and kept together through a sufficient length of time, so that both may be mastered and become automatic in the thinking and doing of the teacher."

Professor Nutt has very ably discussed the modern conception of the high school. This is possibly the best of many good chapters which make up this volume. The reviewer recommends it to every high-school teacher—especially, to those just entering the profession. It will give one a splendid insight into the meaning of adolescence, the purpose of the secondary school, the function of the high-school subjects, and the important aspects of mental maturing.

The author lays down this premise "that each high-school subject must exist for the sake of the pupils and not for the sake of some preconceived

traditional academic standard of so-called scholarship." He then states the function of subjects composing the curricula of the modern high school. The objectives, which he proposes, merit serious study.

On the question of vocational guidance, this very striking and interesting statement is made:

"Very few individuals at the adolescent age possess such marked talent in one line or have such an intense desire in one direction that they can choose, with any degree of certainty, the work in which they will ultimately find the greatest satisfaction . . . . therefore an attempt to induce an early choice of a vocation and to select those high-school subjects that are best adapted to preparing the pupil for the particular vocation chosen is a hazardous venture."

"The high school is responsible, however, for giving as much accurate information as possible concerning the various vocations that may be chosen by the high-school pupils later in their lives, and ample opportunities for participating in vocational activities as a means of making intelligent choices should be afforded."

Professor Nutt has prepared a book which applies the fundamental principles of teaching to the high-school subjects in the same significant and helpful manner that many of our educational writers have done for the elementary-school subjects. It is one of the best texts on the teaching of secondary pupils the reviewer has ever examined. It is a genuine pleasure to review a book and be able to give it your unqualified endorsement.

H. L. DONOVAN

Eastern Kentucky State Normal School and Teachers College, Richmond

GAMBRILL, BESSIE LEE. *College achievement and vocational efficiency.* (Teachers College Contributions to Education, No. 121.) New York: Teachers College, Columbia University, 1922. 100 pp.

Doctor Gambrill has divided her study into eight chapter heads, viz., "The Relationship Between College Rank and Success in Life," "Previous Studies of Success in College in Relation to Success in Life," "College Marks as Related to Income Twelve Years after Graduation," "Extra-Curricular Activity in Relation to Income," "Influence of the College Course upon the Vocations of College Graduates," "Other Factors Having a Possible Bearing upon Success in College and Success in Vocation," "Summary and Conclusions," and "Some Problems of College Education Suggested by this Study."

A general summary of the author's conclusions are: (1) The relation between college standing and income after graduation is too slight to warrant the use of marks as the chief basis for predicting success. (2) The low correlation between marks and income probably means that the qualities which lead to vocational efficiency, as indexed by the world at large, are only in part, the qualities measured by success in the college curriculum. (3) The relation between extra-curricular activity and income is somewhat closer than that between scholarship and income. (4) Until we can measure the initial traits and abilities which a student possesses when he enters college, we have no certain means of measuring the degree to which either college studies or

extra-curricular activities have contributed to the final product. (5) Scholarship seems to be a selective factor with reference to vocation in a considerably greater degree than with reference to success in a specific vocation. (6) The college plays a very small part in the vocational decision of its graduates.

These and other conclusions are based on carefully worked out data. The book is a distinct contribution to this interesting field for investigation. It should be of great interest to college faculties and especially teachers of education.

EDWIN L. HOLTON

Kansas State Agricultural College, Manhattan

KNIGHT, F. B. *Qualities related to success in teaching.* (Teachers College, Columbia University Contributions to Education, No. 120.) New York: Teachers College, Columbia University, 1922. 67 pp.

Determination of teaching efficiency is perhaps the most vital question confronting the school superintendent. Upon its successful solution depends not only the excellence of the additions to the teaching force but to a large degree the attitude of those teachers already in service. On the one hand the taxpayer demands that salary increases shall be based upon merit. On the other hand the morale of the teachers is influenced by a conviction that increased efficiency will bring prompt professional and financial recognition. The necessity for some accurate method of rating teachers has long been recognized by the school superintendent, and any light upon this vexing question is more than welcome.

Mr. Frederick B. Knight has made a significant addition to the literature on this subject in his monograph, "Qualities Related to Success in Teaching." His conclusions are based upon a study of the teaching ability of 156 grade and high-school teachers in three Massachusetts school systems. Ratings were secured from supervisors, mutual judgments of the teachers themselves, and a concensus of pupils' opinions.

Experience indicates that a general reputation for excellence in any profession is reasonably accurate, and this well-known fact is the basis for the conclusions reached by Mr. Knight. The high correlation between the ratings obtained by the three methods is most significant. The mutual ratings of the teachers correlate with the ratings of supervisors plus 0.962. The correlation of teachers' ratings with those secured by pupils' opinions is less significant, plus 0.681. This seems to indicate that pupils are more influenced by personal considerations than the supervisors. Corroborative evidence of the ability of teachers to rate each other appears in the fact that the ratings for specific traits such as intellectual strength and skill in discipline show a correlation between chance halves of plus 0.879 and plus 0.838.

A surprising conclusion, but one abundantly justified by the collected data, is the slight effect upon general teaching ability of certain specific factors which are generally supposed to affect the quality of the teacher's work. School superintendents have generally assumed that experience is an index of a teacher's value to any school system, and salary schedules usually provide an additional allowance to new teachers for each year of experience. This

study indicates that amount of experience cannot be considered a factor of large significance in the assurance of a teacher's success.

Still more surprising is the lack of evidence of any increase in efficiency due to professional study while in service. This is in harmony with the generally accepted fact that a high scholastic standing does not necessarily imply successful teaching experience. The computed correlation, plus 0.36, between teaching ability as determined by supervisors' estimates and professional study seems to afford little justification for the plan sometimes followed of making additional salary allowances for summer-school work. A more probable explanation is that good teachers because they are interested in their work take summer courses for the sake of improving their technique. Other factors such as age, amount of salary, normal-school standings, etc., seem even less significant than the two mentioned above.

Teacher-rating schemes thus far developed depend upon the score card and the study of specific traits. The conclusions reached in this study seem to disprove the soundness of any such plan.

D. C. Bliss

Montclair, New Jersey

News Items and Communications

This department will contain news items regarding research workers and their activities. It will also serve as a clearing house for more formal communications on similar topics, preferably of not more than five hundred words. These communications will be printed over the signatures of the authors. Address all correspondence concerning this department to Doctor E. J. Ashbaugh, Ohio State University, Columbus, Ohio.

The Sophoclean Dramatic Club of Hampton Institute presented recently Van Dyke's "House of Rimmon." This four-act religious drama set a new high standard for the dramatic work in that institution.

Dr. Carter Alexander, who has been working on the educational finance inquiry for the past two years, has published an article on "Opportunities for Research in Educational Finance" in the April Number of the *Phi Delta Kappan* and in *Educational Administration and Supervision*, as well. We call attention to the article thinking that some of our readers will be particularly interested in it.

Kansas City, Missouri, reports that 81.8 percent of the children entering the elementary grades graduate from these grades in their school system, and that 23.6 percent of the pupils entering the elementary grades are now graduating from the high school. We wonder how these percents would agree with similar data from other large cities.

The manual of physical education, prescribed by the State Board of Education of West Virginia, contains a large amount of material which should be of definite assistance to teachers in elementary grades and rural schools. Drills, games, forms for records, and bibliographies are presented in most usable form.

Some time ago we called attention in this department to the Rochester, New York, Chart of Minimum Requirements for Primary Reading. We have more recently received a corresponding Chart of Minimum Requirements for a Course in Phonetics. The chart provides very definite directions for the teacher regarding the material and method of presentation, and covers the work in the first three grades.

Dr. J. F. Furstman, new health commissioner of Peoria, Illinois, recently recommended "that the weighing and measuring of school children be discontinued until such time when we know more about the reliability of these systems of measurement and weight than we know at present." The recommendation was unanimously adopted by the Board of Education. Have our school people in the many cities over the country which have been doing extensive weighing and measuring been misled regarding the relation between height-weight index and health?

Bulletin No. 2236 of the University of Texas is devoted to arguments pro and con of a mill tax for the support of higher educational institutions in Texas. The material was prepared primarily for use in connection with the debates among schools belonging to the University Interscholastic League. It contains so much material of value to those who are studying the question of mill tax versus legislative appropriation for the support of public higher institutions that it should be called to the attention of all those interested in this problem.

Visual instruction has gained for itself such a definite place in the schools of Berkeley, California, that a committee of teachers has formulated a course of study in this subject for the use of the elementary schools, including the kindergarten and first six grades. No. 7 of the Berkeley Course of Study Monographs for Elementary Schools presents the report of this committee. This monograph is full of definite helps to the teacher, for it not only suggests sources of material but methods of use as well. It is the most valuable contribution in this field which has come to our attention.

We wish to call our readers' attention to the new national society which originated in Cleveland at the time of the meeting of the department superintendents. It is the National Society for the Study of Educational Sociology. The officers for the current year are: President—W. R. Smith, University of Kansas; Secretary-Treasurer—C. C. Peters, Ohio Wesleyan University; Executive Committee—David Snedden, Ross Finney, and E. George Payne. Those interested in this particular field may well get in touch with either Doctor Smith or Doctor Peters for further information concerning the society.

A leaflet has recently been issued by the World Book Company which users of the National Intelligence Test will find particularly helpful. It contains revised age and grade norms on the basis of over thirty thousand cases. It also contains mental-age equivalent of the scores in both the A and B scales. The relatively few cases upon which the standardization of National Intelligence Tests has hitherto rested have thus been abundantly taken care of. The leaflet to which we are referring will be sent free to users of the test.

The Ohio High School Standards, 1923, prepared by Walton B. Bliss, assistant director of education, is a 175-page manual of suggestions and requirements for high-school teachers and administrators. It contains six chapters, the headings of which will be suggestive of their content: (1) the high-school teacher's horizon, (2) the junior high school, (3) detailed standards for senior high school, (4) high-school programs of study, (5) brief discussions of various fields of subject matter, and (6) library and apparatus.

Bulletin No. 53 of the Bureau of Educational Reference and Research of the University of Michigan reports the results of the Woody-McCall Arithmetic Test given last October. The outstanding results are:

1. A rather striking uniformity in the results achieved in the different cities.
2. The standards of achievement for the different Michigan cities virtually approximate the 1923 revised Woody-McCall standards.
3. The cities with a population of less than five thousand inhabitants achieved as much on the Woody-McCall test as the larger cities.

Practice Tests in Common Fractions, prepared by Edward Wildeman, principal of the Shields School, Chicago, are published by the Plymouth Press. The booklet contains 93 exercises of from twelve to fifteen examples each and covers the general field of operations with common fractions. It is designed for the use of the individual pupil and all computations are made upon ordinary scratch paper. The booklet may, therefore, be used over and over again. A casual examination reveals the fact that the examples frequently contain fractions which are not found in daily life. To what extent such material is necessary to develop the degree of skill and ability which our elementary-school children need is an open question at the present time.

The latest school survey to come to our desk is that of Logan County and Bellefontaine, Ohio, by Doctor C. C. McCracken of Ohio State University. The survey was made during the school year, 1921-22, at the invitation of D. H. Sellers, the county superintendent. The work included a thorough examination of the child population and the conditions of the county with reference to centralization and consolidation; the preparation, experience, and certification of the teachers; and the financial conditions which support the schools. It represents an extensive cooperative effort which elicited the hearty response from the entire teaching and administrative force of the county. The report closes with a large number of specific recommendations among which the most unusual, perhaps, is that both county and city districts be put under one administrative head.

Bulletin No. 12 of the Bureau of Educational Research, University of Illinois, written by Charles W. Odell, is entitled "The Use of Intelligence Tests as a Basis of School Organization and Instruction." Doctor Odell presents the results of an investigation extending over nearly two years in which he has studied with unusual care certain of the questions involved in the proposal that we reorganize our schools on the basis of the results gained from the use of general intelligence tests. The experiment was conducted in the Chicago schools and comprised grades I to VIII, inclusive. The final conclusions on the matter may be summarized as follows: For pupils of all degrees of intelligence combined, the experimental plan of organization was more efficient in indicating progress and about the same in indicating achievement when compared with the traditional plan. For children of superior mentality the experimental plan was even more advantageous than for the duller children.

We are indebted to Mr. T. V. Goodrich, director, Department of Measurement and Research of Lincoln, Nebraska, for the following school data: On the basis of returns from thirty-one cities ranging in population from 40,000 to 100,000, between 1910 and 1920 the median increase in total enrollment was 12.8 percent; in the high-school enrollment, 7.7 percent; and in number of high-school graduates, .97 percent. The same data for the two-year period, 1920 to 1922, showed a median increase in total enrollment of 4.2 percent; in high-school enrollment, 3.9 percent; and in the number of high-school graduates, .64 percent. On the basis of fifty cities within the population range, indicated above for the year 1921-22, the median number of children enrolled per 10,000 total population was 169.1; high-school enrollment, 28.5; and high-school graduates, 3.4. The median high-school enrollment in 1920 in these cities was 1,256, and in 1921-22 it was 1,600. Such data indicate that there is still room for a very heavy increase in high-school enrollment in our cities.

The English teachers of the eastern and southern divisions of the Colorado Educational Association recently adopted a platform in which they stated the amount of equipment they believe is needed in the high-school room for the teaching of English. The recommendations in part were:

1. The minimum equipment will include: (a) one unabridged dictionary; (b) a literary map of England; (c) several collections of English and American literature; (d) a fairly complete edition of the works of such English and American authors as are best fitted for high-school pupils; (e) such office room as will secure a reasonable degree of privacy to English conferences.

2. The following equipment is recommended: (a) a Victrola and records useful for the study of literature; (b) a well-equipped stage for the production of plays; (c) lantern, pictures, etc.; (d) periodicals such as the *Literary Digest*, *Drama*, *Outlook*, *English Journal*, etc.

The third Annual Session of the Ohio State Educational Conference was held at Ohio State University, Columbus, on April 5, 6, and 7. An attendance of nearly four thousand Ohio school people attested their interest in the program. Three general programs and twenty-four sectional programs fur-

nished a rich and varied offering to those in attendance. Bagley, Judd, Colvin, and Works were the headliners from off the campus at the general programs. A total of 90 speakers addressed the twenty-seven different meetings, 11 of whom were persons from without the state of Ohio. The general topic was "Objectives in Education" and this theme was carried out not only in the general programs but in the sectional programs as well. A general evaluation of the conference was expressed by one of the school men of the State to a member of the executive committee in the following words: "It was a much better Conference this year than we had last, and I dare you to excel it next."

Albert G. Belding, supervisor of commercial education, New York City, in speaking before the shorthand section of the New York Society for the Experimental Study of Education discussed one phase of stenographic training which has too often fallen short. "The matter of speed is important. I do not want you to neglect that, but I think attention should be called to the fact that these boys and girls are going into business offices where they will be required to punctuate, spell, and arrange letters neatly on the page, and most important of all, transcribe exactly what has been dictated and not what they think has been dictated. They should be able, when required, to compose letters and to perform those tasks that are expected of the private secretary. Rarely, or never, do we hear complaints from business men that our stenographers do not have sufficient speed. What we do hear is that our boys and girls cannot spell or punctuate, and that they make ridiculous errors in spelling and punctuation, and that they show that they do not have training in language sense." Speaking at the same time Dr. E. R. Hope of Lebanon Valley College, Annville, Pa., pointed out five fields of research in the general field of stenography. The five were: (1) research as to the mechanism of the typewriter and the system of shorthand; (2) research as to prognosis in stenography; (3) research regarding the content of the courses in stenography; (4) research as to the methods of teaching stenography; (5) research as to the measurement of results.

An experiment of inviting parents to attend one day's school session was tried in the Minneapolis public schools for the first time recently. Each pupil made out a program of his day, and sent it with an invitation to his parents. Two thousand responded, and teachers were in their rooms prepared to receive the "new" students. From beginning to end the day was a miniature of a real school day. Eight periods, each reduced to ten minutes, were planned with the lunch period after the fifth, and an auditorium period following the last. Except for a corps of boys in scout uniforms who helped the visitors to find the classes, the pupils were absent from the building.

In this case, the teachers used the time to explain to the parents the nature of the work which was given in this period to the pupils who attended the regular day session. In other cities, "Go-to-school" nights have been planned, when the pupils were present in their places and the school was conducted as during the regular day period except that the periods were

shortened. In such cases the parents were able to see the children at work under almost normal conditions; while at Minneapolis the teachers had the full time to explain to the parents the nature of the work which was being done. It appears to us that either type has some advantages over the other. Any arrangement, however, which secures visitation on the part of the parent is worth while in developing the relationship which ought to exist between the home and the school.

We are interested in calling to the attention of our readers the action of the Portland (Oregon) Grade Teachers' Association in originating and having presented to the Oregon Legislature a bill indorsing educational research. The introductory statement, or title, of the bill states that it is "an act to provide for a department of research and guidance in public schools in school districts having a population of 10,000 inhabitants or more, defining its duties and functions, defining the term 'educationally exceptional children,' and authorizing the board of directors of such districts to establish special classes and special schools for such children, and authorizing the board of directors to require the attendance of such children at such schools." As was to be excepted, the bill encountered some stiff opposition in the legislature, but in amended form was passed. The original bill made mandatory upon the board of directors the establishment of departments of research and guidance, but as the bill was finally passed it became permissive legislation only.

When elementary teachers who are working continually and directly with school children espouse in such a way the scientific attack on the problems of education and make provision for its administration, it is exceedingly encouraging and most hopefully prophetic.

The chief opposition seems to have been (1) that there was a teachers' lobby; (2) that children should be shielded from "stigma"; (3) the economic question of increased taxation. The Portland Grade Teachers' Association is certainly to be congratulated upon the passage of their bill even in its amended form.

With the general attention given now to the subject of physical education throughout the country, definite information regarding the status of this line of work in our schools is timely. The following facts concerning physical education in Texas is presented for the information of our readers, hoping that similar data from other states may be sent to the editor.

On the basis of about a fifty percent return on the questionnaires sent out, the following facts were revealed: eighteen percent of the cities has one or more full-time teachers or supervisors of physical education; seventeen percent had one or more part-time teachers, leaving 65 percent of the cities having no teachers of physical education. Eighty-five percent of the cities, however, reported teachers coaching athletic teams, about half of whom were receiving salary increments for the work. Approximately half of the cities give the elementary-school children a physical examination, usually once each year. Sixty-six percent of the cities report instruction in health; sixty-one

percent, in hygiene; fifty-two percent, in sanitation; and seven percent report some attack on the problem of sex education. But twenty-four percent of the cities require all pupils in the elementary schools to take physical education, and but nine percent report that physical education is required of all high-school pupils. On the basis of eighty-six replies from county superintendents, no county in the state has a full-time physical director, and but two counties report a part-time physical director. Sixty-four percent of the counties reporting showed no physical examination for rural children. Sixteen percent, however, report physical examination in all the rural schools of the county.

Mr. William R. Flowers, principal, Eastern High School, Baltimore, Maryland, has regrouped the pupils in his school on the basis of ability with very satisfactory results. In a report to Doctor Stenquist, director of the Bureau of Educational Research, he states as follows: "The school contained 180 pupils in grades V to VIII inclusive, some of whom were doing little or no studying at home, while others were forced to work long hours at home. All pupils in a given grade were attempting to carry the same program of work which was departmental throughout. In making the reclassification and readjustment a signed statement was secured from each home giving approximate time devoted to home work each day. Each pupil was given the National Group Intelligence Test, both forms; and the faculty divided classes into sections according to (a) the teacher rating of each pupil in each study, (b) the total time devoted to home work, and (c) the intelligence test score. The differentiation in the treatment of the ability groups was as follows: (a) The best section of each grade was required to do all the printed course of study in each subject, and even more if found advisable. (b) The medium section was to have briefer assignments than the best section, and even have no home assignments, or in certain subjects on 'home nights.' (c) The slow section was to have less extensive aims and less home work than either of the other sections."

A circular letter was sent to the patrons outlining the reclassification scheme and stating definitely the section in which a given pupil was to be placed. The letter further contained the statement that at the end of each succeeding report any pupil whose classification was shown to be incorrect would be transferred to what seemed to be a more fitting section. The results have been highly satisfactory since not one protest received was from a patron, and very few cases of readjustment were found necessary. In some cases pupils themselves asked to be placed in lower classes, and in others asked what to do to be placed in a higher section. There has been a complete cessation of complaints from patrons about home work, and for two years 100 percent of the pupils have been promoted, although in previous years from 6 to 8 percent had failed.

In order to discover what use was being made of intelligence tests in different universities throughout the country, the Committee on Intelligence

Tests, Kansas State Teachers College (Pittsburg) sent out a questionnaire asking the following questions:

1. To what extent are intelligence tests being given?
2. Who has charge of administering them?
3. What uses are made of the results?
4. Are the results satisfactory?
5. Are the scores made known to the students?
6. What procedure is used in case of pupils receiving low scores?
7. What tests were used?
8. What is the approximate number of students tested?

Returns were received from eleven large universities, five technical schools, and fifteen teacher-training schools, making a total of forty-three different institutions.

The apparent trends in the testing of university students were indicated by the following returns:

1. Forty out of forty-three of the institutions were giving tests.
2. Freshmen classes, psychology classes, and English classes were most frequently tested.
3. The work of giving the tests was generally in charge of the Psychology Department or the Department of Education.
4. Some of the uses made of the tests are as follows:
   a. To determine fitness for entrance.
   b. To decide whether or not a student should be dismissed.
   c. In limiting the number of hours for a given student.
   d. To stimulate the bright students.
   e. As an aid in placement after graduation.
5. Seventy-five percent of the institutions using tests reported the results as satisfactory.
6. None of the institutions favored broad-cast dissemination of scores; only about half favored even a restricted revelation to students; a clear statement to make the results known to the instructors and then only on request.
7. The tests most frequently used were the Army Alpha, the Thorndike, and the Thurstone.

Miss Myrtle L. Kaufmann, supervisor of elementary grades in Logansport, Indiana, has sent us copies of new report cards and report card records which have been put into use in the schools of that city. The report which goes to the parents indicates scholarship not in terms of percents nor letters, but in terms of above average, average, and below average. Approximately 40 percent of the pupils are included in the average group. In addition a check is made of habits and attitudes desirable for good citizenship and health. Traits and habits to which attention is called are courtesy, effort, fairness, and neatness. The following taken from the memorandum sheet sent with the cards to teachers and principals will explain more fully what Miss Kaufmann and those associated with her in devising the new cards wish most definitely to accomplish by their use.

1. The classification of poor and failing pupils in one class designated as "below average," eliminates the necessity of discriminating each time the card is issued, between those who fail and those who do not fail.
2. In order to eliminate broad discrepancies in grades due to the differences in standards of individual teachers, it is planned to require

grades to conform to the normal curve of distribution. It is not a serious matter for grades to deviate slightly from the percents allotted on the Report Card Record. But any considerable variation is justified only by evidence.

3. Education consists of more than scholarship. All the more up-to-date report cards contain provision for the recognition of habits and attitudes desirable for good citizenship and of personal traits and habits which are desirable. The teacher is given full freedom as to the habits and attitudes to be emphasized and given especial recognition. The committee had in mind such habits and attitudes as the following: recognition of the rights of others, helpful participation in the affairs of the school and the community, obedience to the laws and regulations of the school and the community, honesty, cooperation, helpfulness to others, respect for the preservation and care of all personal and public property, respect for the wishes of the majority, response to worthy appeals of all sorts, punctuality so far as others are affected by it, independence, and reliability.
4. The health note need not be filled out for children whose physical condition is satisfactory. It provides, however, a means of calling the parents' attention regularly to such matters as the following: under weight; low nutrition; defective teeth; defective hearing; defective vision; adenoids; inadequate sleep; and lack of cleanliness of body, teeth, hair, or clothes.
5. The parent keeps the report. The advantage in this is apparent when compared with a hasty signing and returning. There is further benefit in the sending of each report on a clean sheet containing no record of previous shortcomings.
6. By listing the cause of absence the parent is brought to consider the necessity and the legitimacy of the absence.

The following is a brief of the report by Superintendent Charles R. Tupper of Miami, Arizona, showing something of the use to which educational research may be put under a situation somewhat more difficult than that found in the average American school. Miami is a mining city of about 10,000 population, having come into existence in the short space of twelve years. The population is cosmopolitan and transient, there being a continual income and outgo of workers and families. Many racial groups are represented, but the Mexican element predominates in the schools with fifty percent of the enrollment. A survey conducted by the Red Cross indicated that more than half of the families had three or more children and that at least half of the homes had three rooms or less and were in "bad" condition. Such home environment added to the fact that many pupils never hear English spoken in the home, makes good school work difficult to attain. The schools enrolled 1,880 pupils, only 40 percent of whom have been in the local system more than two years, and 34 percent have been in the schools one year or less.

Mental surveys made by means of the Otis and National Group Intelligence Tests indicate about 75 percent of the pupils are below the standard mental development for their age. The majority of this mental retardation is found among those of Mexican and Indian strain. In order to apply scientific measurements, a trained director of research and a trained and experienced primary supervisor were added to the staff three years ago.

Preliminary investigations showed 47 percent of the pupils over age and 15 percent of the enrollment failing. In reading, only 22 percent of the children tested reached the standard score for their grade; while in arithmetic, spelling, and handwriting the number attaining standard scores were 11, 42, and 8 percent, respectively. Mental surveys discovered mental-age differences as high as ten years in the same class group. Attempts to remedy the situation were made by placing the pupils according to mental ability in limited and normal groups. By this plan each teacher handles an A and B division of each grade in one room, but all children in the room are either limited or normal. The limited groups are kept below 30 in enrollment and include those who learn more slowly and need more individual help to cover the ground. Homogeneity is on the basis of similarity of Intelligence Quotients. The limited groups confine themselves to fundamentals and minimum essentials as defined in the course of study; while the normal groups cover more work and branch out into supplementary study.

This plan has been in operation for the past two years and already shows some interesting results. For example, the percent of over-age pupils has decreased from 47 percent to 34 percent. Statistics from the entire state show an average retardation or over-ageness of 44 percent. Under-age pupils have increased from 3.6 percent to 8 percent, compared with an average of 5 percent for the state as a whole. Eleven percent of the enrollment received extra promotions of a half year or more. After one semester trial in the advanced class it was found that 39 percent of these accelerated pupils were doing superior work and although 15 percent doing inferior work none of them were failing. The percent of pupils failing has been decreased from 15.3 percent to 5, and as the fourth year draws to a close every indication points to the fact that 5 percent or less will fail this year.

The question may be raised as to whether this lessening of failures may have been at the cost of efficiency of class work. From the results of standardized tests it is known that this has not been true. In reading, the percent of pupils attaining standard scores in comprehension has increased from 22 to 40. Standard scores in arithmetic have increased from 11 to 28, in handwriting from 8 to 17.5, and in spelling from 42 to 62. Tupper concludes: "With decidedly inferior pupil material, surrounded by unsatisfactory homes and social conditions, with low regularity of attendance, with a passing procession of pupil personnel, with all of these discouraging and unfavorable handicaps to contend with the Miami schools have reduced their failures to one-third their former amount, have doubled the quality of pedagogical performance in certain essentials, and have advanced from a rear rank to a front rank position in the county. This record is not due to superior teaching personnel, but to the use of scientific measurements consistently applied to the problems of school administration."

Educational Research Association

(HARRY A. GREENE, *Secretary and Editor*)

One of the frequently neglected but nevertheless very important functions of an organization such as the Educational Research Association, is the collection and recording of some of the smaller bits of scientific data which might otherwise be lost or at least not be made available for general use. Many tentative experiments, many preliminary investigations, are not accessible to those interested in similar fields because the investigator feels that they are not worthy of publication. These bits of evidence must not be disregarded, and more, they must not be lost. It will be one purpose of the editor of this department to collect from the members many contributions of this type. A special appeal is made at this time for such material.

Not only will this department continue to be a recorder of material of this sort but it will continue to be a clearing-house for communications, questions, criticisms, and suggestions of all kinds related to the work of the association. Report the work you are doing, and the work you intend to do. Submit criticisms of your own work and of that of others. Criticism is fruitful of thought and progress. Raise the questions that are bothering you. Someone may have the answer. This department is yours. It can not continue to be effective without your positive and tangible support.

DATA ON THE REPETITION OF CERTAIN MENTAL TESTS

The questions of the consistency and reliability of certain measures of general mental ability have been much discussed in recent literature on measurements. The following data dealing with repetitions of certain mental tests are reported herein partly for their significance and partly for the purpose of permanently placing them on record. The data were collected by Superintendent Theodore Saam of Council Bluffs, Iowa, and are reported with his permission. The tabulations and computations involved are the work of the writer.

The data as originally submitted consisted of three displays. The first series represented Intelligence Quotients for three grade sections obtained from repetitions of the Terman Group Test one year apart. The summary of these data is reported in Table I which follows. The relation of Intelligence Quotients obtained by repetition of the Stanford Binet Test at intervals of one to four years is shown in Table II. The relation of Intelligence Quotients obtained by the Terman Group Test and the Stanford Binet Test given at intervals of one to four years is given in Table III.

TABLE I. I.Q.'s ON TERMAN GROUP TEST AFTER ONE YEAR

Grade	Number Cases	Mean		Standard Deviation		r	P.E.$_r$
		1st	2nd	1st	2nd		
VII–1	37	95.4	98.6	18.1	19.0	.95	.01
VII–2	32	98.1	98.7	18.5	16.5	.94	.009
VIII–1	169	100.3	99.8	16.0	14.5	.87	.015

TABLE II. I.Q.'S BY REPETITION OF TEST. (Interval one to four years)

Grade	Number Cases	Mean		Standard Deviation		r	P.E.$_r$
		1st	2nd	1st	2nd		
I to VII	94	102.7	102.6	18.0	16.5	.69	.03

TABLE III. I.Q.'S BY TERMAN GROUP TEST AND STANFORD BINET
(Interval from one to four years)

Grade	Cases	Mean		Standard Deviation		r	P.E.$_r$
		Stanford	Terman	Stanford	Terman		
Opportunity room.....	17	77.8	71.9	9.0	6.4	.57	.110
VI–2.....	17	106.9	108.1	17.7	21.0	.89	.033
VII–1.....	226	100.7	101.2	15.4	14.4	.80	.02
VII–2.....	171	102.1	103.7	14.5	14.0	.80	.01
VIII–2.....	39	101.6	98.2	17.5	19.0	.76	.05

RELATIVE ACHIEVEMENTS OF DULL AND BRIGHT CLASSES

The Accomplishment Quotient (A.Q.) is rapidly coming into use as a means of ascertaining which pupils achieve most in relation to their intelligence. The same method can also be used with success in the case of whole classes by considering the central tendency score of a class as representative of its achievement or level of ability. The need of such determinations is great. Questions constantly arise as to the truth or falsity of statements made on the basis of observation that classes of low intelligence actually achieve more in proportion to their abilities than classes of high average standing in intelligence tests. Besides, it is highly desirable to determine the status of individual classes with a view of giving them due recognition for doing the best that they are able no matter what their intelligence may be.

To try to answer some questions in this connection for St. Paul, we have calculated the A.Q.'s of forty VIII-A classes and of thirty-two VII-B classes. The quotients are for three subjects of study and are based on median scores in the following tests: Thorndike-McCall Reading Scale; the average of two of Monroe's Standardized Tests in Arithmetic; the average of three spelling tests from the Ayres' Scale.

In the case of the Thorndike-McCall scale, there are adequate age norms available. For the other tests, it was necessary to calculate standards from our own data, which is a laborious process. When this had been completed,

the results were in the form of median educational ages in each of the three subjects for each individual class in the two grades. We already had the median mental ages for the VII-B classes on the Terman Group Test of Mental Ability and for the VIII-A classes on the Illinois General Intelligence Scale. The next step was to calculate A.Q.'s. This was done by dividing the median educational age of each class by its median mental age.

In order to ascertain the relation between A.Q. and intelligence level, the classes were arranged in order beginning with the highest in mental ability. The average A.Q. was then figured for the classes falling into each quartile. This furnished the average A.Q. for the classes in the upper, third, second, and lowest fourths according to median mental age. Their relative accomplishments could then be directly compared. Table I gives the facts as found.

TABLE I.—ACCOMPLISHMENT QUOTIENTS BY QUARTILES

Grade VIII-A	Read.	Arith.	Spell.	Average
Average A.Q. for classes				
In fourth (highest) quartile in intelligence	101	101	98	100
In third quartile in intelligence	103	106	106	104
In second quartile in intelligence	105	105	105	105
In first (lowest) quartile in intelligence	105	107	106	106
Average A.Q. for all classes	101	104	104	103
Grade VII-B				
Average A.Q. for classes				
In fourth (highest) quartile in intelligence	101	97	97	98
In third quartile in intelligence	103	109	104	104
In second quartile in intelligence	104	104	105	104
In first (lowest) quartile in intelligence	108	106	107	107
Average A.Q. for all classes	104	103	103	104

This table shows that there is a measurable difference in relative accomplishment between dull and bright classes and that the advantage lies considerably with the former. This does not mean that the absolute performances of the brighter classes were less, because their median scores were in general greater. It does mean, however, that when we make allowances for their superior mental abilities as measured by reliable tests, their relative achievements are smaller than those made by classes of duller children.

Of what significance are these findings? A complete interpretation is naturally difficult because of the many factors demanding consideration. It seems evident, however, in the light of data secured by other workers and confirmed here that bright pupils and bright classes do not work up to capacity. They need to be stimulated to more complete mastery of their studies. Furthermore, the data indicate that dull classes and dull pupils are on the average working hard and master the subject matter of their studies as satisfactorily as can at present be expected. For them, we need sharply differentiated courses specially designed to fit their needs and capacities.

O. J. JOHNSON

Assistant Director of Research, St. Paul

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Work in all the standard academic branches (Languages, Fine Arts, History, Mathematics, etc.) is provided for students in the College of Education by other Colleges of the University. This includes courses given from the standpoint of content and courses in methods of teaching the various subjects.

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